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ABSTRACT

Documented are the activities of the Modeling Panel of the Graduate Medical Education National Advisory Committee (GMENAC) charged with three fundamental tasks: (1) to estimate physician manpower requirements for the year 1990 in each of 23 specialty areas; (2) to project physician supply for 1990 in each of these areas; and (3) based upon comparison of projected requirements and supply, to make recommendations concerning graduate medical education to balance projected supply and requirements. Part I offers an introduction and overview of GMENAC's project. Part II describes the "adjusted needs-based model" and the process of estimating its parameters using delphi panels. Part III summarizes the requirements estimates for each specialty. Part IV discusses supply projections, including a description of the "GME Model," a model of the graduate medical education adopted by GMENAC. Part V discusses the disparity between supply and requirements and makes recommendations for the future direction of graduate medical education. Among the recommendations cited are: no new allopathic or osteopathic medical schools should be established beyond those with first-year students in place in 1980-1981; the ability to read, write and speak English should remain a requirement for all alien physicians; and in view of the projected oversupply of physicians, the need to train non-physician health care providers at current rates should be studied. Members of the Graduate Medical Education Advisory Committee Model Panel and the Physician Specialty Delphi Panels are listed, and tabular statistical data and summaries are included. (Author/LC)

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Report of the Graduate Medical Education National Advisory Committee

to the Secretary, Department of Health and Human Services

ED203766

Volume II

Modeling, Research, and Data Technical Panel

HE 014 021

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U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Health Resources Administration

The Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health and Human Services, consists of seven volumes:

Volume I	GMENAC Summary Report
Volume II	Modeling, Research, and Data Technical Panel
Volume III	Geographic Distribution Technical Panel
Volume IV	Financing Technical Panel
Volume V	Educational Environment Technical Panel
Volume VI	Nonphysician Health Care Providers Technical Panel
Volume VII	GMENAC Members' Commentaries and Appendix

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Report of the Graduate Medical Education National Advisory Committee

to the Secretary, Department of Health and Human Services

Volume II

Modeling, Research, and Data Technical Panel

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Health Resources Administration
Office of Graduate Medical Education

DHHS Publication No. (HRA) 81-652

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September 30, 1980

The Honorable Patricia Roberts Harris
Secretary
Department of Health and Human Services
Washington, D.C. 20201

Dear Madam Secretary:

The attached Report of the Graduate Medical Education National Advisory Committee (GMENAC) is in fulfillment of the Committee's responsibilities under the Charters of April 20, 1976, May 1, 1978, and March 6, 1980.

The charge of the Committee was to advise the Secretary on the number of physicians required in each specialty to bring supply and requirements into balance, methods to improve the geographic distribution of physicians, and mechanisms to finance graduate medical education.

GMENAC significantly advanced health manpower planning in direct and indirect ways.

> GMENAC introduced new scientific methodology: Two new mathematical models were developed to estimate physician supply and requirements.
>
> GMENAC refined the data bases; figures for estimating the supply of practitioners in every specialty and subspecialty from the distribution of first-year residency positions have been developed.
>
> GMENAC integrated the estimates of supply and requirements for physicians with nurse practitioners, physician assistants, and nurse midwives.
>
> GMENAC introduced new concepts to clarify assessment of the geographic distribution of physicians and services; standards are proposed for designating areas as adequately served or underserved based on the unique habits of the people in the area.
>
> GMENAC recommends that medical service revenues continue to provide the major source of funds to support graduate medical education.
>
> GMENAC has initiated a collaboration between the private sector and the Government; the unique expertise of each achieves a level of comprehensiveness in health manpower planning not previously experienced.
>
> GMENAC estimates a surplus of 70,000 physicians by 1990. Most specialties will have surpluses, but a few will have shortages. A balance by 1990 cannot be achieved. Until supply and requirements reach a balance in the 1990s, GMENAC recommends that the surplus be partially absorbed by expansion of residency training positions in general/family practice, general pediatrics, and general internal medicine.

Recommendations are directed at achieving five manpower goals:

1. To achieve a balance between supply and requirements of physicians in 90s, while assuring that programs to increase the representation of minority groups in medicine are advanced to broaden the applicant pool with respect to socio-economic status, age, sex, and race;

2. to integrate manpower planning of physicians and nonphysician providers and to facilitate the function of nonphysician providers when their services are needed;

3. to achieve a better geographic distribution of physicians and to establish improved mechanisms for assessing the adequacy of health services in small areas;

4. to improve specialty and geographic distribution of physicians through financing mechanisms for medical education, graduate medical education, and practice; and

5. to support research for the next phases of health manpower planning.

The Committee unanimously recommends the immediate establishment of a successor to GMENAC. Its establishment is essential to the implementation of the manpower goals and recommendations in the Report. The full GMENAC methodology must be applied to the six specialties which have not been analyzed. The requirements estimates for each of the specialties and subspecialties must be tested, monitored, and reassessed on a continuing basis. Important studies on financing, geography, and nonphysician providers should be undertaken.

The collaborative working relationship between the private sector and the Government facilitated a congruence of interest in planning and in implementing improvements to best meet the needs of the Nation. The momentum of this collaboration should be continued without interruption.

Respectfully submitted,

Alvin R Tarlov

Alvin R. Tarlov, M.D.
Chairman
Graduate Medical Education
National Advisory Committee

For the Committee

PREFACE

This report summarizes the work of the Modeling Research, and Data Technical Panel of the Graduate Medical Education National Advisory Committee (GMENAC) in collaboration with the Health Resources Administration, Office of Graduate Medical Education (OGME) and its contractors. This work reflects some of the efforts of the Modeling Panel members, over 50 individuals staffing OGME and its contractors, and the more than 200 clinicians who participated in the Delphi Panel process over the past 3 years. One report could not encompass the richness and depth of this endeavor.

In the time and space available, we have summarized the analytic framework used to explore physician supply and requirements now and in the future and the current and potential contribution of the graduate medical education system to these parameters. And we have included the main results of the Modeling Panel's deliberations. It is the intent of the Office of Graduate Medical Education to develop a series of publications to include a detailed rendering of the material produced for and with the Modeling Panel of GMENAC. The intent of OGME is to solicit critiques from as wide an audience as possible in order to improve our knowledge of physician manpower analysis. The estimates given in this report should be viewed with caution as they were derived from a methodology which is still in its infancy.

The principal authors of this report were John Wills and Louis Garrison of the Battelle Human Affairs Research Centers, and Itzhak Jacoby, Director of the Office of Graduate Medical Education, Health Resources Administration, DHHS. Several sections were contributed in essentially final form by other authors. In particular, Gail Issen wrote the section on Emergency Medicine; Karen Rudzinski wrote the sections on Dermatology, Obstetrics/Gynecology, and Psychiatry, and Robert Thorner the section on Child Care. All three are with the Office of Graduate Medical Education.

Extensive contributions of drafts, working papers, and background data were also made by other individuals. Barry Greengart of OGME coordinated the computer program used in deriving estimates of specialty-specific service needs. Janet Cuca and Lew Aumack, assisted by Octavious Tracy, all of the Office of Graduate Medical Education contributed materials on Preventive Medicine and Adult Care, respectively, which we have drawn upon liberally. We have also drawn upon reports written by Leon Hunt and Teresita Hernandez under contract to the OGME (Contract No. HRA-232-79-0094), and have benefited from a number of conversations with Mr. Hunt. David McNutt, former Director of the OGME, and Jerald Katzoff of OGME contributed significantly to both the modeling effort and this report. The final editing of this volume was done by Gail Issen.

In addition, we have drawn heavily on two earlier studies done for OGME by Battelle (Contract No. HRA-232-79-0032 and Purchase Order No. 80R048285901D), and have benefited from the advice of Edward B. Perrin, Director of Battelle's Health and Population Study Center.

Wherever possible, we have cited the sources which we have used in this report. But since much of the material was in the form of an individual's notes or drafts of meeting minutes or briefing papers, it was not always possible to give a genuine bibliographic reference.

Therefore, we wish to emphasize again that this report is in every sense the joint effort of the individuals named previously, and that the contribution of the principal authors has largely been one of organizing and synthesizing their work, in order to make the report comprehensible as a unified, "stand-alone" document. Those of us who have had the privilege of working with the GMENAC Modeling Panel will recognize that this Final Report mirrors the teamwork that has been a feature of the effort over the past 2 years.

William F. Donaldson, M.D.
Itzhak Jacoby, Ph.D.
John Wills, Ph.D.

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I. INTRODUCTION AND OVERVIEW

This report documents the activities of the Modeling Panel of the Graduate Medical Education National Advisory Committee (GMENAC).

The Modeling Panel was charged with three fundamental tasks:

(1) To estimate physician manpower requirements for the year 1990 in each of 23 specialty areas,

(2) To project physician supply for 1990 in each of these areas, and

(3) Based upon a comparison of projected requirements and supply, to make recommendations concerning graduate medical education positions which would move the Nation toward a balance between projected supply and requirements.

The magnitude of the charge was clearly broad. There was little previous work which could guide the Panel, and what work had been done was fragmented, partial, and often outdated. Never had there been a detailed specialty-by-specialty study of U.S. physician manpower needs using a consistent and acceptable methodology. Nor was there any methodology available when the Panel began its work for projecting supply on a specialty-by-specialty basis while accounting for the intricacies of specialty training patterns, specialty-specific attrition, foreign and U.S. graduates, etc. The Modeling Panel literally built its projections from the foundation up, developing the necessary data bases and models, obtaining the necessary projections and reconciling diverse estimates at all stages of the process.

The Modeling Panel's efforts were focused on two broad projects:

(1) Estimating specialty-specific physician manpower requirements, and

(2) Estimating specialty-specific physician supply under alternative scenarios.

In order to estimate physician manpower requirements, the Panel adopted a generic requirements model which could be applied to all the clinical specialties. The parameters of this model were then estimated by groups of experts (Delphi Panels) using a modified Delphi method. A separate Delphi Panel addressed each specialty. The results of each specialty's Delphi process were then reported to the Modeling Panel, which reviewed the estimates, reconciled across-panel inconsistencies, and forwarded recommendations for requirements estimates to GMENAC.

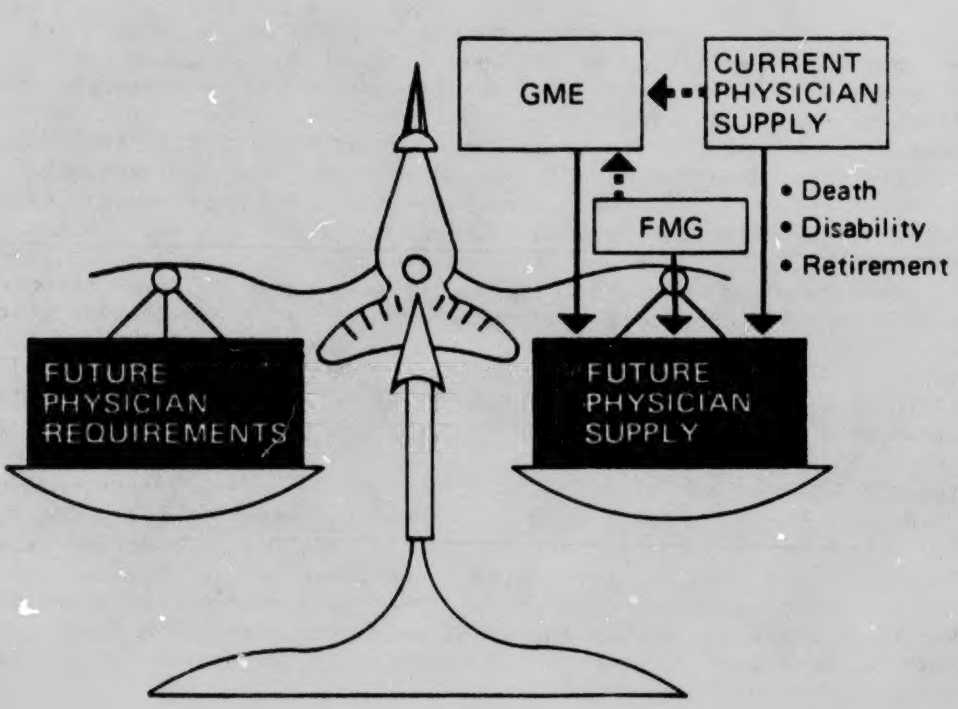
On the supply side, the efforts of the Modeling Panel were directed toward creating a model of physician supply which was accurate at the individual specialty level and which accounted for the crucial link between residency training and ultimate specialty of practice. This modeling framework is outlined in Figure I.1, which also summarizes the broad charge to the Modeling Panel.

A more complete discussion of this physician requirements model can be found in Part II, which describes the "adjusted needs-based model" and the process of estimating its parameters using Delphi Panels. Part III summarizes the requirements estimates for each specialty, including a discussion of the data developed by the Delphi Panels, the various issues and problems addressed in each specialty, and the critical aspects of each specialty's requirements calculation.

Part IV discusses supply projections, including a description of the "GME Model," a model of the graduate medical education process which proved essential to the development of the supply model adopted by GMENAC. The "GME Model" traces the paths through graduate medical training which a given group of entrants would be expected to follow, based on a probabilistic analysis of past cohorts of graduates. Clearly, this behavior is a key to predicting future specialty supply. The remainder of Part IV integrates projections of medical school graduates, foreign medical graduates (FMGs), attrition rates, and other factors with the GME model to come up with specific projections of manpower supply.

As will be seen, under the most probable scenario, the disparity between supply and requirements will be significant. The final Part, Part V, discusses this problem and makes recommendations for the future direction of graduate medical education.

FIGURE I.1 THE MODELING FRAMEWORK


GME
CURRENT PHYSICIAN SUPPLY
FMG
• Death
• Disability
• Retirement
FUTURE PHYSICIAN REQUIREMENTS
FUTURE PHYSICIAN SUPPLY

18

II. THE ADJUSTED NEEDS-BASED MODEL: STRUCTURE AND ESTIMATION

INTRODUCTION

The members of GMENAC accepted the challenge in the charter of improving the specialty distribution of physicians as a national objective. In order to make recommendations on how to promote a better distribution, it was essential to have some idea of both what improved distribution consists of and how the expected distribution falls short. This Part discusses the methodology adopted by GMENAC for determining a desirable specialty distribution for the year 1990. In particular, it describes the steps involved in selecting a methodology and presents the structure of the adjusted needs-based model for physician requirements, the key element in the methodology. Finally, the text describes the process by which the model was estimated.

SELECTING A METHODOLOGY

As background to developing a requirements methodology, GMENAC members and staff heard presentations from knowledgeable persons and carefully considered the various manpower forecasts and forecasting methods presented in the literature. The remainder of this section describes in greater detail the steps and considerations underlying their selection of a methodology.

1. Previous Estimates

A first step taken by GMENAC was to study the previous estimates of the numerous physician manpower studies in the literature. The Committee members benefited greatly from a recent literature review by the Bureau of Health Manpower 1/, uncovering more than 133 references, mostly since the mid-1960s, relating to physician requirements estimation. Of that number, 42 were analyzed and described in detail. The review shows that for some specialties, such as allergy, neurosurgery, and plastic surgery, the requirements estimates vary only slightly from study to study. Yet, a difference of a few physicians per 100,000 population in such specialties may have significant effects on service availability and on physician time devoted to various types of medical problems or conditions. On the other hand, for specialties such as internal medicine and psychiatry, the range in requirements estimates using various

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1/ Bureau of Health Manpower, 1976.

methodologies and variable assumptions show a difference greater than 15-fold between the low and high requirements estimates. Given the broad ranges of some estimates and the multiplicity of studies, this literature review attested to the fact that there was no consensus on physician requirements.

GMENAC identified the linkage of forecasting methods to health policy goals as a key element in the modeling process. In fact, the Committee members suggested that the most important single factor responsible for the divergence of results in many studies was not the differences in the methods themselves but the different goals or purposes for which the various forecasting methods were employed. They agreed that the choice of a method or model for forecasting must first relate to the purpose or function to be served by the model in the planning process. Determination of technical specifications of the model and the data required to use it would, therefore, depend upon this definition of purpose.

In contrast to most earlier studies, GMENAC considered all specialties of medicine simultaneously. This comprehensive review was essential to enabling the Committee to make rational recommendations regarding improved specialty distribution. To meet this objective required an approach flexible enough for all medical practices, yet capable of providing comparability across specialties. The existing literature on methods of requirements estimation was further reviewed with this in mind.

2. Methods of Requirements Estimation

A review of the literature 1/ characterized requirements methods as two general types: needs-based and demand-based. Need and demand have been defined as follows:

Need:	That quantity of medical services which expert medical opinion believes ought to be consumed over a relevant time period in order for its members to remain or become as healthy as possible given by existing medical knowledge.
Demand:	Multivariate functional relationship between the quantities of medical services that its members desire to consume over a relevant time period at given levels of prices . . . financial resources, size and psychological wants of the population as reflected by consumer tastes, and preferences for all goods and services. 2/

1/ U.S. DHEW, PHS, HRA, Bureau of Health Manpower, 1978.
2/ Jeffers et al., 1971.

Using these alternatives as the basis for estimating specialty requirements can yield very different estimates. "Need" and "demand" forecasts differ by relying on alternative judgments of the appropriate data on which to calculate the "required volume of services," "allocation of services across specialties," and "rates of productivity." Simply put, estimates based on "need" calculate medical service requirements on the basis of projected biologic requirements and determine specialty workload allocations and productivity on the basis of expert judgments of best medical practice technique. Estimates based on "demand" result from calculations of medical service requirements, specialty workload allocations, and productivity which in turn is based upon current actual market behavior of medical care consumers and providers. By these computations, this method attempts to account for preferences, incentives, inefficiencies, and scarcities of the market place. What follows is a summary of the pros and cons of needs-based versus demand-based methodologies.

Needs-Based Methods--The classic needs-based study had not been repeated since Lee and Jones carried it out in 1933. [1] This technique utilizes norms or standards and requires panels of medical experts, which may also include other professionals or lay persons, to assess:

-- The number of persons in the population who should receive the specific kinds of services from the practitioner, allowing for age, sex, or other demographic factors that influence the incidence and prevalence of the disease or condition requiring care

-- The average amount of service time or the number of services that should be provided for each disease or condition group that affects the population

-- The average number of services of each desired kind that should be provided by the individual practitioner

Given these data, it is possible to calculate the total number of physicians required, now or in the future. This calculation is done by multiplying the number of individuals in the population by the total number of diseases or conditions and the services required per disease or condition for each specialty and then dividing this product by the average workload or desirable workload of each category of specialist. In this method, the health problems that are expected to occur serve as the basis for establishing the desired level of manpower.

This approach is logically appealing because it starts with the disease and disability burden of the population, translates those into required services, and finally into need for medical personnel. It is an easily understood and defensible method of establishing needs for specific types of manpower. The method permits care for healthy persons and other preventive service needs to be included in the estimates. Also, the method allows for substantial disaggregation of both the health services being provided and the kinds of personnel required. Similarly, the requirements may be calculated in a variety of service time measures--per episode, per person, per year--that a practitioner should spend in providing "good" care.

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[1] Lee and Jones, 1933.

The application of this technique however, has several shortcomings. First, in the absence of objective criteria, it is necessary to establish panels to render judgments about the volume of required services. The selection of professional and perhaps lay persons to serve on such panels involves the politically difficult feat of balancing the views of disparate groups so that the final recommendations will have credibility and maximum acceptability to the population.

Second, standards for services required for various conditions predicated on expert opinion fail to consider explicitly the general level of health implied by the judgments of medical need. It is one thing to develop requirements for medical care based on an infant mortality rate of 15 per 1,000 live births and quite another to predicate requirements on the elimination of infant mortality altogether, particularly when such goals are in competition with other societal objectives. Standards for health should be stated first and physician requirements derived from them. Given the absence of such standards, all that can be done is to assemble expert opinion on the relationship between the alteration of disease or improvement of health, and the number of visits or other services or processes that should be consumed. The ultimate service intensity that will be rendered to the public cannot be determined on scientific grounds.

Third, the clinical determination of medical need and service intensity is based on group averages rather than the characteristics of subpopulations. The same treatment for the same disease in different persons does not always result in the identical outcome. Therefore, needs-based estimates of physician requirements may be satisfactory for a large population, such as a heterogeneous Nation, but are fraught with problems when applied to subpopulations such as ethnic neighborhoods or communities.

Finally, by not addressing considerations of individual preference and access barriers, needs-based requirements fail to yield any insight into the modifications required of the delivery system to utilize all of the "needed" physicians if their services were in fact available; i.e., needs-based requirements may bear little resemblance to employment opportunities for physicians, unless the people in need of services are educated and able to use the services as specified and the physicians and services are arrayed so that the defined needs can be met.

Demand-Based Methods--Requirements forecasts based on market demand are predicated on actual or projected utilization or market behavior of a target population. By extrapolating from actual (observed) medical market phenomena, these forecasts embody current interacting individual preferences for medical care delivery of all consumers, providers, third-party payers and regulators, given the current institutional structure and distribution of income and resources.

It is possible when using demand models to attempt to inflate or deflate the calculated demand in a direction that correlates better with other knowledge about health status and service utilization. Conceptually, the boundaries on demand-based forecasting models are defined only by the availability of utilization data and the imagination of the investigator. Like needs-based methods, the demand-based models also require expert judgments about future events if any change from the status quo is to be included in the projections.

The three types of demand models are demographic models, economic models, and economy-based models. Demographic models relate demand to a set of demographic variables such as age, education, income, sex, race, and marital status. These models contain implicit assumptions about unchanging health patterns, modes of health delivery, and physician productivity. In essence, current utilization rates are held constant for each population subgroup, and only the population changes are considered.

Economic models usually delimit a finite network of causal relationships among consumer, provider, and third-party payer behaviors as they interact with utilization. Variables might include percent of services prepaid, coinsurance options, consumer price index fluctuations, changing consumer preferences for competing as well as noncompeting goods and services (e.g., rising household energy costs relative to out-of-pocket costs of preventive care), provider preferences for leisure versus higher income and hours worked, and cost-effectiveness of auxilliaries. A model which estimates primary care utilization as a function of price, other access variables, and demographic variables, necessarily argues that changes in primary care utilization caused by price change, for example, do not affect other health system behavior which might in turn generate secondary impacts on primary care utilization. The intricacy of economic models requires equally extensive data collection. One notable model, for example, employs more than 100 equations and endogenous variables. 1/ While the model theoretically accounts for a wide variety of cause-effect links, its intricacy makes data collection required for implementation formidable, if not impossible.

The economy-based models generally link the demand for health professionals with the general structure of the entire economy. The Bureau of Labor Statistics, Department of Labor, bases its projections on its economic growth model of industry changes and its occupational matrix. The models may be useful in evaluating the manpower implications of general economic trends, but provide little or no useful insight into the specialty mix required to deliver projected volumes of services. This method is not useful for evaluating alternative policy strategies in the health sector nor is it useful for evaluating "need" for services.

Demand-based methods yield estimates for physician requirements which reflect in part the preferences of individuals for medical care. As such they are a statement of the "value" society places on these services

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1/ Yett et al., 1975.

vis-a-vis the availability of other useful goods and services given existing resource constraints. This statement of "value" is tempered by consumer ignorance, access barriers, and the existing physician and income distributions. Like the needs-based models, the demand-based methods require extensive data bases including the projected behavior patterns of population groups. Market-demand models are useful in attempting to asess the response rates of utilization to various policy variables. Knowledge of how consumers and providers react to changes in fees or coinsurance rates, for example, affords policymakers a view of actual behavior that is valuable in selecting among strategies for achieving a health system goal.

The major shortcoming of the market-demand models is that unless they are linked to an assessment of needs, they are unlikely to lead to the development and realization of physician requirements sufficient to deal with unmet needs nor be sensitive to the changing patterns of disease as they affect individual specialty profiles, practice characteristics and educational curricula. All these require considerable lead-time for needed adjustments to be made. To the extent that any agreement exists that there are supply-requirements imbalances today, or are likely to be in the future, market-demand forces are largely responsible. Existing data bases reflect the results of those market-demand forces in quantitative terms. Use of a demand-based model without adjusting the existing data base inputs to the model produces a mirror image of today's system for the future, with the same advantages and limitations.

3. GMENAC's Approach To Modeling

After reviewing the advantages and disadvantages of needs-based and demand-based models, GMENAC decided that neither type was specifically suited for the task before it. A demand-based approach extrapolated from current utilization rates might perpetuate many of the inequities in the present system, and run the risk of creating a shortage of physicians and steep cost inflation if national health insurance is enacted. On the other hand, a needs-based approach runs the risk of projecting physician requirements beyond what consumers can afford or are willing to purchase or consider useful, thus creating an excess of physicians in an economic sense. Faced with the limitations of existing methods of forecasting requirements and the need to respond to diverse policy issues, GMENAC chose to pursue the development of an "adjusted needs-based approach" to the estimation of physician manpower requirements.

While being more like a needs-based than demand-based model, as its name indicates, this approach tempers the estimates with some considerations inherent in demand-based models. In general terms, the starting point in the process is to estimate the total service requirements of the population based on surveys of disease and disability rates. Preventive service requirements are added to this total. This starting point is chosen so that estimates will be sensitive to the problems of the disadvantaged, the underserved, and other persons not receiving health service benefits. The second step in developing an adjusted needs-based approach is to estimate the proportion of persons with each disease or disability (or for whom preventive services are to be planned) who are likely to utilize the services given the expected financing system, geographic distribution, cultural attributes, and consumer educational efforts. This latter step is where the adjustment to a needs-based model is made. In this way the forecasts are modified by the expectations of future realities of provider and consumer behavior as well as of institutional constraints.

Finally, the adjusted needs-based model produces a set of estimates that GMENAC considered in the light of both other estimates and other goals. The estimates from an adjusted needs-based approach are not necessarily identical with the specialty distribution that GMENAC recommends achieving in the future. In the first place, the methodology by its very nature is an iterative process, and a large part of its function is to help identify gaps in existing knowledge. Second, even overlooking these limitations due to the newness of the method, the projected requirements must consider tradeoffs in resource expenditures for physician services with other important programs.

The Structure of the Adjusted Needs-Based Model

GMENAC adopted a methodology for estimating requirements in which the underlying structure is an "adjusted needs-based model." Although this methodology can and will be, for this discussion, separated conceptually into the model and the estimation process, this split is somewhat artificial given the methods employed. In particular, the judgment of experts is relied upon not only in the estimation process but also in determining the finer details of the model. Thus, the model and the estimation process are not independent. The adjusted needs-based model provides a general, basic structure for a common approach to diverse specialty areas, but the details of the model are left to the experts preparing the estimates. In the remainder of this section, the adjusted needs-based model will be described at a general level. The details of the experts' role in the estimation process are left for Part IV.

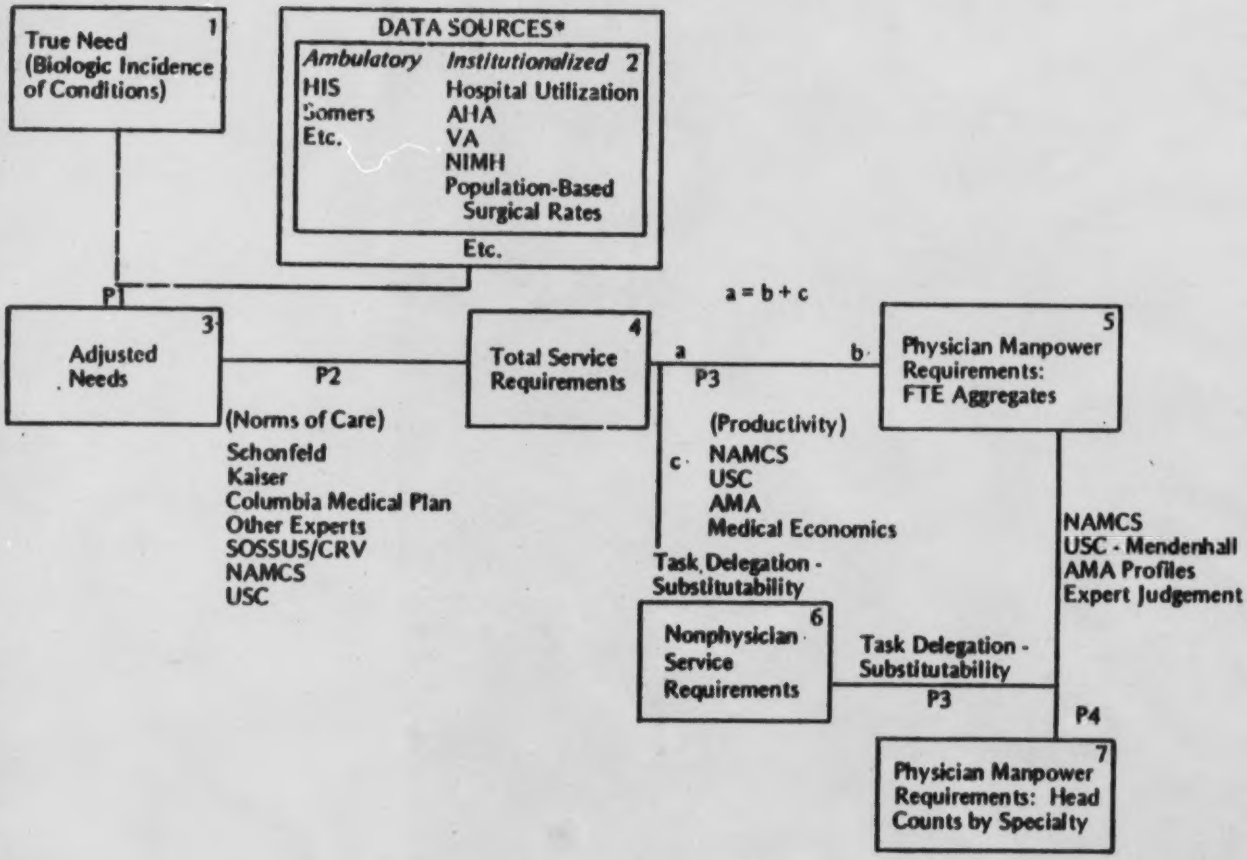
1. General Structure

Figure II.1 illustrates the general structure of the adjusted needs-based model as developed by GMENAC. The basic structure of this adjusted needs-based model can be described simply: For a given specialty, episodes of illnesses treated by that specialty give rise to a "need for care" by that specialty; the "norms of care" to treat that illness appropriately generate a volume of services required from the given specialty, and the "productivity" or services provided per specialist permits the conversion of the total volume of services required into the number of required specialists. Clearly, it is a needs-based model; the term "adjusted" is used to connote several features: (1) actual epidemiological and utilization data are adjusted by experts to reflect their judgment of measurement problems or of future trends;
(2) utilization data are adjusted to incorporate expert opinion on

appropriate treatment, and (3) the whole model is adjusted in that the estimates are tempered by knowledge of the realities of provider and consumer behavior as well as by institutional constraints foreseen for the projection period. Certain "upper limit" assumptions are introduced, e.g., utilization is not predicated on the ability to pay.

Figure II.1 shows the major components of the model and the points at which parameter estimates are required. These major components are the need for care, the norms of care, and the productivity of physicians. The four points in Figure II.1 labelled P1-P4 represent the points in the model where parameter estimates are required.

FIGURE II-1 GENERIC MODEL: PHYSICIAN REQUIREMENTS ESTIMATION


True Need (Biologic Incidence of Conditions) 1
DATA SOURCES*
Ambulatory
HIS
Somers
Etc.
Institutionalized 2
Hospital Utilization
AHA
VA
NIMH
Population-Based Surgical Rates
Etc.
P1
Adjusted Needs 3
P2
(Norms of Care)
Schonfeld
Kaiser
Columbia Medical Plan
Other Experts
SOSSUS/CRV
NAMCS
USC
Total Service Requirements 4
a = b + c
a
b
c
P3
(Productivity)
NAMCS
USC
AMA
Medical Economics
Task Delegation - Substitutability
Physician Manpower Requirements: FTE Aggregates 5
NAMCS
USC - Mendenhall
AMA Profiles
Expert Judgement
Nonphysician Service Requirements 6
Task Delegation - Substitutability
P3
P4
Physician Manpower Requirements: Head Counts by Specialty 7

Footnotes to Figure 1

- P1 - True need is based on changes made to existing epidemiologic data and adjusted need is based on the percentage of true need which should be handled by a particular specialty.

- P2 - Norms of care in terms of visits and surgery for each specialty and proportion of visits which should be delegated to nonphysician health care providers.

- P3 - Productivity of specialists in terms of number of visits provided within a week, and hours spent in patient care. Productivity data on specialists are adjusted for changes ensuing as a result of utilization of services, other than direct visits, provided by nonphysician health care providers.

- P4 - Calculation of manpower requirements is made by changing FTE requirements into total requirements based on the proportion of a specialist's workload devoted to nonpatient care activities (e.g., teaching, research, administration).

2. Components of the Model

Need for Care--In general, an individual is said to need medical care if a pathologic finding exists, or if the individual will benefit from such care. Obviously, some people currently receive care that is not needed, and others need care but do not receive it. This definition is not necessarily predicated on illness because preventive care as well as well person consultation (i.e. insurance or pre-employment examinations) is included in needs. As a practical matter, however, the vast majority of care needed from most specialties can be considered on a disease-specific basis.

Because manpower requirements in the generic model are computed for each specialty separately, it is necessary to modify the definition of the need for care in that regard. The question becomes, for each disease category, how many people will need treatment by a given specialty? The answer is a product of four factors: (1) population size and characteristics in the projection year, (2) the incidence or prevalence of the disease, (3) the proportion of those with disease who need to see a physician, and (4) of those seeing a physician, the proportion who need to see the specialty under consideration.

Norms of Care--The norms of care are the types and amount of services required of a specialist in a given specialty to treat those persons needing care for a specific illness. The types of services considered are such things as office visits, hospital visits, and surgical procedures. The amount of service required is expressed as the total number of each of these types required per year.

It is important to note that a norm of care for a particular illness represents an average across all patients with that specified illness. Some patients will require more care and others, less. This averaging, necessitated by a heterogeneous patient mix within an illness category, can, of course, be refined by identifying subgroups with different norms of care. This multiplies the number of estimates required, and it seems unlikely that repeated subdivision would ever yield completely homogeneous subgroups. Thus, for each illness category, a decision must be made concerning the trade-off between making more estimates and estimating across a more heterogeneous population.

Ultimately, the amount of required services must be converted from the number of required units of care to the total time required for provision of those units. Again, this requires a decision about the level of aggregation at which to estimate the model. For example, an estimate could be made of the average number of minutes required per office visit for a given illness. Alternatively, the average amount of time required for an office visit averaged across all visits for all illness could be used. The trade-off is the same as that faced above -- the cost of estimating more parameters versus the difficulty of averaging.

Productivity--Productivity is defined as the amount of service produced per year of specialist labor. The amount of each type of service produced annually depends on both the average amount produced per hour of specialist labor and the number of hours spent producing each service type in a year.

Physicians provide a variety of services, including both the patient care activities discussed previously, and nonpatient care services such as teaching, research, and administration not directly attributable to the patient care activities. In addition, the practice of medicine requires that professional time be spent in activities such as continuing education, and this necessarily reduces the amount of time a physician can spend in patient care. Thus, if one thinks of the number of physicians required to produce any patient care service load in terms of "full-time equivalents" (FTEs), it is apparent that the ultimate manpower requirements must be greater than the simple sum of these FTEs across patient care service type.

If the time required for the treatment of each illness were estimated as part of the norms of care, then the only two productivity estimates required to estimate the model would be the total annual hours worked and the proportion of time spent providing the designated patient care services. On the other hand, if the norms of care do not include estimates of disease-specific time requirements, then productivity must be estimated in a fashion which will yield indirectly the average time required per unit of service. For example, the average number of units produced per hour for each specific service type can be estimated. This results in an estimate of the time required to provide that type of service averaged across all types of illnesses. With this estimate, the number of required FTEs to provide this service can be derived.

One important determinant of the number of physicians required to meet health care needs is the degree to which nonphysician aides can be used to assist the physician. Use of nonphysician health care providers can reduce the workload required of physicians in two ways. First, they may be able to assume, more or less completely, responsibility for providing certain services; that is, entire patient encounters might be delegated to nonphysicians. Second, aides and assistants can enhance the productivity of physicians with whom they work in concert, by performing certain tasks which would otherwise require the time of the physician. In this latter case, their impact on physician manpower requirements is revealed not directly, by reduction of service requirements, but rather implicitly, through the increased capacity of the physician for whom they work to provide care.

ESTIMATING THE ADJUSTED NEEDS-BASED MODEL

The preceding section discussed the general features of the adjusted needs-based model. This section discusses the finer details of the model, how they are related to the estimation process, and the nature of the estimation process itself. The key feature of the estimation process is the reliance on expert judgment. Experts reviewed the best available existing data and, combining it with their judgment, made estimates of the parameters of the model. The results of each round of parameter estimates were then reviewed again by the panel of experts. The reasons for differences were discussed and an attempt was made to reach a greater consensus. This iterative process is known as the Delphi technique.

1. The Period of Projection

The adjusted needs-based model can in principle be estimated for any time period. GMENAC chose the year 1990 as the target period. This period was chosen because it is far enough in the future for recommended policies to have some effect, while not so distant as to invalidate the analysis. GMENAC recognized that many of its working assumptions may change by then, and, therefore, urged that the whole process be reviewed and updated at least every 4 years.

2. General Assumptions

The adjusted needs-based model is a normative model in the sense that many of its parameters are estimated by asking what their values should be rather than what they are or what they will be in the projection period. At best, background data provide the values of parameters or trends in parameters in alternative settings. On the one hand, GMENAC wanted its recommendations to be sensitive to the problems of the disadvantaged, the underserved and other persons not receiving health service benefits. On the other hand, estimates must be tempered with some realism about the progress obtainable by 1990. In a general sense, the experts were to adjust their estimates of who should receive care with some consideration of who is likely to receive care given the expected geographic distribution, cultural attributes, and consumer educational efforts. It cannot be overemphasized, however, that these considerations were not dealt with explicitly by the expert panelists but, rather, operated on some implicit level, as a backdrop to the process.

3. The Finer Structure of the Model

Besides making parameter estimates, the expert panels had to make decisions about the units of analysis of the model. Their choices were based on both their knowledge of factors important to particular specialties and on the availability of background data. The issue was often one of aggregation. What disease conditions can be grouped? Should office and hospital visits be differentiated? Can minutes per encounter be averaged over all encounters? These specific questions are illustrative of the issues raised. What follows is a more detailed discussion of some of these issues.

Choice of Conditions--To apply the adjusted needs-based model to a given specialty, it is necessary to decide upon the conditions (disease categories) seen by that specialty. Since most specialists see a diversity of illnesses, the list could become impossibly long if every condition, including those rarely seen, were included. This comprehensive list of conditions would make the estimation burdensome, without greatly improving the final estimate of manpower requirements (since the manpower requirements implications of rare or infrequent conditions are marginal). For these reasons, only those conditions which constituted the bulk of the practice of a given specialty were selected for disease-specific estimates of needs and norms. Allowance was made for the additional conditions treated by the specialty that were not explicitly considered by adding an estimate of the aggregate service requirements for all nonitemized conditions.

Choice of Services--The adjusted needs-based model deals with three general types of services: Office visits--a physician-patient encounter in the physician's office; hospital visits--a physician-patient encounter in the hospital, and diagnostic and therapeutic surgical procedures, whether in the hospital or the office. The productivity component of the model adjusts for the educational, research, and administrative services that are part of professional activities. Obviously, not all types of services are of equal importance to different specialties. The expert panels decided which ones to use in the model.

Productivity--The lack of background information regarding average time (in minutes) for services performed by a given type of specialist for a given condition necessitated the use of the average time across all disease categories for each service category, i.e., hospital visits and office visits, for some specialties. Rather than estimate these overall averages directly, they can be inferred from estimates of a series of productivity parameters, including the following general elements: (1) an estimate of annual hours worked--the product of the number of weeks worked per average year and the number of hours worked per average working week; (2) an estimate of time allocated in an average week to the provision of the various services; and, (3) an estimate of weekly productivity--how many units of a given type of service are provided per typical work week. Estimates of these elements imply the total annual time working, the hourly productivity for visits (or its inverse, the average time per visit), and the proportion of time spent in nonpatient care activities or providing unmeasured services.

4. The Estimation Process

The Delphi Technique--Application of the adjusted needs-based model requires estimates of most of the following parameters for each specialty:

-- The incidence and prevalence of morbidity conditions

-- Proportion of those with a given illness needing physician care

-- Proportion of those needing physician care who need specialist care

-- Office visits required in a year per episode of illness

-- Hospital visits required in a year per episode of illness

-- Surgical procedures required in a year per episode of illness

-- Average time spent in providing each type of service

-- Average number of different conditions treated per visit ("simultaneity of care")

-- Number of units of a given type of service that could be provided in a year by the typical specialist in question

-- Number of hours worked in an average year by the specialists in question

-- Distribution of working time by type of service provided for those specialists

-- Work that could be delegated to nonphysician providers

In order to estimate these parameters GMENAC chose to rely upon a "consensus of experts" technique. Panels of physicians and other health care professionals were assembled for each specialty. Structured questions, designed to obtain estimates of the parameters of the model, were posed to the panelists, whose answers led to a final estimate based on their judgments. Each parameter was estimated at least twice. At the end of the first interaction of estimates the results were collated and presented to the panelists, and a second set of estimates was made.

In its classic form this technique for arriving at estimates is known as a Delphi technique. The method actually used by the specialty panels differed from the classic Delphi method in that face-to-face discussion of the various estimates was permitted, whereas the classic Delphi technique isolates each member of the estimating panel. Each individual's estimates were made anonymously, however, and in this way, as well as through the process of presenting for review and re-estimation all parameter estimates, the essential components of the the Delphi technique were preserved.

There were several reasons why reliance on expert judgment was useful for the task at hand. A most important feature of the model is that the parameters are to reflect care that is "needed" and "required for appropriate treatment." Thus, they reflect normative judgments of "good" medical care, not necessarily what is or what will be. The goal of the estimation of the generic model for GMENAC was not simply to project current patterns into the future; rather, it was to identify what would be desirable or what should occur given reasonable assumptions about what is possible. For these estimates expert judgment is the only possible method.

Even where the parameters to be estimated are "objective", e.g., estimates of morbidity rates, available information is often inadequate. In this case, the knowledge of practitioners in the specialty was often the best basis for determining the nature, type, and volume of needs and services.

Each specialty was chaired by a convener who was a member of GMENAC. Staff support was provided at the panel meetings.

Assuring the success of this estimation process entailed two major steps: (1) the collection, organization, and presentation of the best current information to the Delphi Panels; and (2) the constitution of panels of experts to provide estimates and the organization of the Delphi process.

Preparation of Briefing Books--Staff reviewed available data sources and decided which were usable within the structure of the model or, in some cases, where the model might be slightly modified to take advantage of superior data. After making these decisions, effort was devoted to gathering the data and developing a briefing book for each specialty for presentation of data to the panel. Preparing the briefing books involved having special computer runs performed by the National Center for Health Statistics and performing computer runs in-house on very large data sets such as the National Ambulatory Medical Care Survey (NAMCS) and the Hospital Discharge Survey (HDS), as well as collating and summarizing large amounts of information from a variety of other sources.

Most sets of available data on illness and medical care utilization are reported in terms of one of two disease classification systems: (1) the International Classification of Diseases Adapted (ICDA) for use in the United States or (2) the Hospital Adaptation of this code (H-ICDA) developed by the Commission on Professional and Hospital Activities (CPHA) in Ann Arbor, Michigan. Although these two systems have recently developed a new edition (the ninth) of the ICDA and no longer have a different structure, the data available for presentation in the briefing books were classified by earlier editions (ICDA-8 or H-ICDA-2) of the two systems. Since most national data were organized according to ICDA-8, a decision was made to present all background data in the ICDA-8 format. Although ICDA-8 has a built-in system of aggregation, the panels were encouraged to reorganize or reaggregate conditions if it facilitated estimation of any of the parameters of the model.

Role of the Delphi Panels--Given the normative nature of a needs-based model, it was essential to have experts on the treatment of illness. The role of the Delphi Panels of physicians was to combine their personal knowledge of medical care delivery with the background information in the briefing books to develop estimates of the parameters of the generic model. By virtue of the large number of estimates required, their task was a tall one. Furthermore, the Panel had to make decisions about adapting the design of the model to the practice of their specialty, e.g., which conditions to consider, how to estimate time requirements for specific services, etc.

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Constitution of the Panels--The nominees proposed as possible Delphi Panel members were identified at GMENAC's request by specialty societies as well as by members of GMENAC. GMENAC specified the desired composition of particular specialty panels (in terms of the numbers and types of specialties represented). These slots were filled with nominees from the lists.

The Panel Sessions--After the panels were selected, a series of meetings were scheduled. There were usually at least two 2-day meetings for each specialty. During these meetings, the model was estimated reiteratively. Thus, the following steps were repeated several times:

- Staff posed and clarified each question and presented the background data
- The panelists discussed the questions and the data
- Each panelist wrote estimates of the model parameters
- The staff presented the results of the first estimates, and identified areas of disagreement or misunderstanding
- The question was reconsidered in the light of further clarification and panel discussion, and the panelists wrote their revised estimates

Role of the Modeling Panel--After the final Delphi meeting, the Modeling Panel made selected revisions to the Delphi Panel results in order to:

- Eliminate the overlap that inevitably occurred when two or more specialties dealt with the same disease or condition. Of course, some duplication of care for specific conditions was needed, e.g. when combined therapies were prescribed or both surgical and medical care were required for a disease.
- To superimpose on the deliberations of the Delphi Expert Panel's consideration of some economic, social, and behavioral constraints that would affect the overall attainment of the level of services required using the adjusted need approach.
- To consider all the physician supply sources available to meet the total physician requirements in each specialty. The Modeling Panel examined the previous career choices of U.S. and foreign medical graduates, the capacity of the allopathic and osteopathic schools to produce graduates with specialty-specific predilections, and the capacities of the various specialty and subspecialty training programs to produce the numbers of specialists needed to meet the 1990 requirements as recommeded by the Expert Panels in each discipline. Representatives of each Expert Panel were invited to explain their recommendations. Various national

organizations also provided testimony. Information from the Technical Panels on Financing, Educational Environment, Geographic Distribution, and Nonphysician Providers, was incorporated into the Modeling Panel's deliberations.

The Modeling Panel's final recommendations on requirements represented, therefore, a synthesis of all data it received from each of the specialty and subspecialty expert panels and from the other Technical Panels of GMENAC. It considered the physician manpower requirements developed by all the expert panels in view of the constraints of reality on the achievement of those levels of manpower. Its recommendations on requirements represented, therefore, a middle position between what was truly needed and what was reasonably achievable by 1990.

The final level of analysis of physician requirements in each specialty and subspecialty involved a public hearing where the recommendations and rationale that surfaced were critiqued by interested parties. Thereafter, the GMENAC members voted on recommendations from the Modeling Panel by secret ballot. They either accepted the recommendations from that Panel or developed another estimate of physician requirements in each specialty based on all they had heard. The final recommendations from the Committee were derived from a majority vote. Table II.1 displays the ranges of 1990 requirements by physician specialty as adopted by GMENAC. The issues pertaining to each specialty as well as the results and recommendations of the Committee are discussed in Part III.

Table II.1

RANGES OF 1990 REQUIREMENTS BY PHYSICIAN SPECIALTY AS ADOPTED BY GMENAC

SPECIALTY	REQUIREMENTS RANGE[1]
All Physicians	441,400 - 490,050
General/Family Practice [2]	81,000 - 87,000
General Pediatricians	29,000 - 31,500
Pediatric Allergy	800 - 1,000
Pediatric Cardiology	1,100 - 1,200
Pediatric Endocrinology	700 - 850
Pediatric Hematology/Oncology	1,600 - 1,700
Pediatric Nephrology	300 - 350
Neonatology	1,250 - 1,350
General Internal Medicine [3]	65,000 - 75,000
Allergy and Immunology	1,900 - 2,200
Cardiology	7,500 - 8,000
Endocrinology	1,900 - 2,200
Gastroenterology	6,000 - 7,000
Hematology/Oncology [4]	8,900 - 9,100
Infectious Diseases	2,000 - 2,500
Nephrology	2,500 - 3,000
Pulmonary Diseases	3,500 - 3,700
Rheumatology	1,500 - 1,900
Neurology [5] [6]	5,000 - 6,000
Dermatology	6,700 - 7,200
Psychiatry (General)	37,000 - 40,000
Child Psychiatry	8,000 - 10,000
Obstetrics/Gynecology	23,000 - 25,000
General Surgery [7]	23,000 - 24,000
Neurosurgery	2,500 - 2,800
Ophthalmology	11,450 - 11,800
Orthopedic Surgery	14,700 - 15,500
Otolaryngology	7,900 - 8,100
Plastic Surgery	2,550 - 2,800
Thoracic Surgery	2,000 - 2,100
Urology	7,500 - 7,900
Emergency Medicine	13,000 - 14,000
Preventive Medicine [8]	6,800 - 7,800
Anesthesiology [6]	19,000 - 23,000
Nuclear Medicine [6]	3,500 - 4,500
Pathology [6]	12,000 - 15,000
Physiatry [6]	2,400 - 4,000
Radiology [6]	17,000 - 19,000

Footnotes to Table II.1

1/ Requirements estimates include teaching, research and administration activities as well as patient care.

2/ Includes osteopathic general practice.

3/ General internal medicine includes diabetes, geriatrics and nutrition.

4/ Hematology-oncology includes neoplastic diseases.

5/ Neurology includes pediatric neurology.

6/ Six specialties: neurology, physical medicine and rehabilitation, anesthesiology, pathology, radiology, and nuclear medicine have not been studied in depth because neither time nor money were available. Requirements estimates for these specialties were derived crudely by GMENAC from a review of previous manpower studies completed by individual specialty societies and by brief communication with representatives of the specialty societies through telephone, mail, and the public plenary sessions of July 27-29, 1980.

7/ General surgery includes colon and rectal surgery, pediatric surgery and portions of vascular surgery.

8/ Preventive medicine includes public health, occupational medicine and aerospace medicine.

III. SPECIALTY-SPECIFIC REQUIREMENTS ESTIMATES

A. ADULT CARE: GENERAL/ FAMILY PRACTICE AND GENERAL INTERNAL MEDICINE

In terms of the variety of issues considered and the complexity of the interrelationships with other specialties, estimating manpower needs in adult general medical care was one of the most difficult tasks the Modeling Panel faced.

The purpose of the adult care component was to estimate requirements for family practice and general internal medicine. The title "adult care" is a bit misleading, for two reasons:

-- Pediatric care to be provided by these specialties was also explicitly considered; and

-- Not all adult general medical care was "assigned" to this group, portions being diverted to the internal medicine subspecialties (discussed in the next section), pediatricians, and practitioners in emergency medicine.

Thus, special care had to be taken in documenting desirable referral rates and allowing for adult "primary care" furnished by other than general or family practitioners or general internal medicine specialists.

To gain an understanding of the calculation of requirements for general/ family practitioners and general internal medicine specialists (a group henceforth referred to as "GFIM"), it is helpful to think in terms of the following simplified algorithm:

Manpower needs in GFIM = Adult general medical care

Less
adult general care delegated to nonphysician providers

Plus
general care provided to non-adult populations

Plus
requirements for nonpatient care services by GFIM

Less
adult general care provided by the internal medicine subspecialties

Less
adult general care provided by pediatricians

Less
adult general care provided by emergency
physicians

The calculation of manpower requirements in GFIM is discussed below, following this outline.

Documentation of the Manpower Requirements Calculation

Adult General Medical Care--The core of the manpower requirements calculation in GFIM was the estimation of service requirements on a condition by condition basis. The Delphi Panel in adult care estimated, for each condition, the implied workload both for GFIM and the proportion it would refer to the internal medicine subspecialties. An example set of estimates follows:

ICDA: Condition	Estimated incidence/ prevalence per 100,000 age 17 and older	% needing care	% to see GFIM	% of these referred	% of these referred to an IM subspecialty
009: Diarrheal Disease	4750	25%	95%	2%	80%-G 10%-I

Thus, the Panel estimated that in 1990 these would be 4,750 cases of diarrheal disease per 100,000 U.S. population age 17 and above; but that only 25 percent of these needed to see some health professional. Of those seeing a physician or other health care professional, 95 percent should see the adult care specialist. Of these, only a very few would be referred for specialist care (2 percent), mostly to the gastroenterologist (80 percent) but also a few to the infectious disease specialist (10 percent).

For each condition discussed, the Delphi Panel estimated the number of visits required per episode of the condition, and the proportion of these which should be delegated to a nonphysician provider. The remainder constituted the core of the GFIM workload although, as previously discussed, a number of further additions or subtractions were made to account for interrelationships with other specialties or subspecialties.

The Delphi Panel considered over 250 morbidity conditions or groups of conditions, based on the ICDA-8 classification. The list of conditions considered was based upon an examination of GFIM practice patterns from the National Ambulatory Medical Care Survey (NAMCS). Most conditions were considered on a individual "3-digit" basis, although the panel considered aggregated or grouped conditions when low frequencies or ambiguous diagnoses warranted.

In addition to the ICDA morbidities, the Panel gave special attention to family planning and well-care services. Due to the importance of the latter (subsequently emerging as the fourth greatest contributor to the total adult medical care requirements), specific norms of care and delegability estimates were provided for various sex-age subgroupings of the adult population for these services.

As is apparent, the task which faced the Adult General Care Panel was enormous. The Panel met five times for a total of 12 days to make the required estimates, as well as conducting extensive "homework" in reviewing background material and developing individual responses prior to Delphi meetings.

The total number of adult general care visits which the Delphi Panel estimated would be required in 1990 was approximately 1,682,000,000. Adjustments by the Modeling Panel reduced them to approximately 1,060,000,000. Based upon the Modeling Panel estimates, Table III.A.1 lists the conditions or groups of conditions considered to be the major components of the GFIM responsibility in 1990, apart from the matter of delegibility to nonphysician providers.

Delegation to Nonphysician Providers--For each of the conditions considered, the Delphi Panel estimated how many of the total visits required should be delegated to nonphysician health care providers. The Delphi Panel delegated a total of approximately 340,000,000 annual visits to nonphysician providers. As will be discussed below, however, the Modeling Panel revised the number of delegated visits after considering input from the Nonphysician Health Care Provider Panel of GMENAC.

Pediatric care provided by GFIM--The basic estimates of needs for adult general care were made for the population age 17 and over. Of course, family practitioners (FP) and internal medicine (IM) generalists treat younger patients also. The Adult Medical Care Panel estimated the proportion of all GFIM patients that would be younger than 17. This estimate was then used to "inflate" patient care requirements as appropriate. Overall, approximately 15 percent of family practice patients and approximately 3 percent of general internal medicine patients, it was felt, would be younger than 17 years of age.

Requirements for Nonpatient Care Services--Total estimates of medical specialist requirements for 1990 rest primarily on patient care activities but include such supplemental services as research, teaching and administration. Consequently, the FP and IM members of the Adult Medical Care Panel estimated the percent of their proposed 1990 specialty supply of physicians who should be engaged primarily in research, teaching, and/or administration. On the basis of FP estimates of 11.8 percent supplemental requirements and IM estimates of 11.0 percent, (See Table III.A.3), the supply requirements for patient care physicians were multiplied by factors of 1.130 and 1.124 respectively. This translated into an increase of 9,933 FTE family practitioners and 9,581 FTE general internists. (It should be kept in mind that such increases relate only to physicians primarily engaged in such supplemental professional activities and does not include research, teaching and administrative responsibilities of practitioners engaged primarily in patient care, the amounts of which are accounted for within the productivity projections.)

Table III.A.1

ADULT MEDICAL CARE PANEL JUDGEMENTS: MAJOR CONDITIONS CONTRIBUTING TO GFIM PATIENT CARE WORKLOAD (AMBULATORY DATA: TOTAL VISITS)

ICDA	Diagnosis	Pre-Delegation Visits	% of Total
277	Obesity, not specified as of endocrine origin	119,407,351 (36,818,355)	6.7 (3.3)*
401	Essential benign hypertension	117,687,885 (53,239,010)	6.6 (4.7)
715	Arthritis, unspecified	101,929,935 (773,170)	5.7 (0.1)
Y-01	Well Care	99,555,996 (35,793,898)	5.6 (3.3)
R-67	Residual grouping: (710 Acute arthritis due to pyogenic organisms; 718 Rheumatism, unspecified)	93,342,432 (71,626,069)	5.2 (6.5)
250	Diabetes mellitus	45,634,078 (30,422,718)	2.5 (2.8)
493	Asthma	31,736,424 (18,512,914)	1.8 (1.7)
346	Migraine	31,114,144 (4,639,020)	1.7 (0.4)
306	Neuroses, personality disorders, other nonpsychotic mental disorders: Special symptoms not elsewhere classified	28,084,609 (18,723,066)	1.6 (1.7)
364	Functional disorders of intestines	27,456,502 (9,060,645)	1.5 (0.8)
412	Chronic ischemic heart disease	27,103,873 (10,163,952)	1.5 (0.9)
303	Alcoholism	27,020,177 (27,020,177)	1.5 (2.5)
	Cumulative %		41.9 (28.7)

---

*( ) Indicates changes by Modeling Panel on 7/13/80

Adult General Care Provided by the Internal Medicine Subspecialties--The next step in the calculation was to subtract from the total required visits those that will be provided by subspecialists who nonetheless provide some "general medical care." These totals were estimated by the subspecialty Delphi Panels (discussed later), but are reproduced in Table III.A.2 for reference. These visits have been adjusted for delegation to nonphysician providers, as well as for the simultaneous provision of care for more than one condition within a single visit. (This "simultaneity correction" is discussed in more detail later.) As can be seen, this resulted in a reduction of the GFIM workload of approximately 22 million visits. All of these visits were subtracted from the general internal medicine, as opposed to the family practice, workload.

Adult General Care Provided by General Pediatricians--General pediatricians should continue to see some patients beyond the age of 16. Explicit estimates of the appropriate number of visits were derived from the Child Care Delphi Panel; it amounted to a total of approximately 12.4 million annual visits (after correcting for delegation to nonphysician providers and simultaneity of care.)

Table III.A.2

AMBULATORY VISITS PROVIDED BY IM SUBSPECIALISTS WHICH WOULD OTHERWISE BE REQUIRED OF "GFIM"

Specialty	Visits
1. Allergy	770,849
2. Endocrinology	888,715
3. Hematology/Oncology	2,497,333
4. Nephrology	1,916,824
5. Cardiology	1,419,477
6. Gastroenterology	2,678,643
7. Infectious Disease	8,595,377
8. Pulmonary Disease	1,404,181
9. Rheumatology	1,562,185
TOTAL	21,733,584

Adult General Care Provided by Emergency Physicians--Emergency physicians working in emergency rooms provide a substantial amount of general medical care. Approximately 15,000,000 annual visits were subtracted from the GFIM workload to account for this impact. The calculation of this total was based on total projected visits to emergency rooms for

- -- accidents, poisonings, and violence
- -- all other conditions

The USC-Mendenhall data were used to estimate the proportion of patients in each class that were aged 17 or older. Then, (1) the excess of emergency room visits for accidents, poisonings, and violence over total adult first visits for these conditions which the adult care panelists had said would be handled by physicians other than GFIM was subtracted from the GFIM workload; and (2) all emergency room visits for "other conditions" was subtracted from the GFIM workload. The total of these items was, as noted, about 15 million annual visits.

Accounting for Hospital Based Care--The entire discussion thus far has been in terms of ambulatory visits to adult care generalists. But, of course, these practitioners also spend time in hospitals providing inpatient care. The manpower requirements calculation accounted for this care as follows: adult care generalists were estimated to provide, on average, a certain number of ambulatory and a certain number of hospital visits per week. Based on ambulatory service requirements as previously outlined, and projected ambulatory visit productivity, the required number of practitioners was established. Then a check was performed to verify that this number of practitioners would be sufficient to meet also the inpatient care requirements. Since the Delphi Panel had also estimated how many inpatient visits would be required for each condition, it was simple to check this total against the capacity for inpatient care implied by the projected number of practitioners. The check revealed that the estimated number of GFIM practitioners would be sufficient to handle both the required ambulatory and inpatient care.

3. Modeling Panel Review of Adult Care Delphi Panel Estimates

The Modeling Panel assumed responsibility for modifying any Delphi Panel estimates that appeared particularly problematic; approximately 50 percent of the ICDA items or groupings were changed in one or more ways. Changes were made at any and all points in the generic model but were most likely to occur in relation to the following.

Incidence/Prevalence--Most commonly, major changes were made when the reference data (HIS, NAMCS, or special data sources) and the Adult Medical Care Delphi Panel judgments differed significantly; in such instances, a more intermediate value was chosen. In other instances the judgments of more specialized Delphi Panels were given preference: e.g., ob/gyn in relation to female genitourinary disorders; rheumatology in relation to arthritic and rheumatic disorders, and psychiatry in relation to mental disorders.

Norms of Care (Number of Visits)--Reductions in the norms of care for various conditions reflected the Modeling Panel's judgment that a larger number of visits in 1990 should accrue to specialists or subspecialists rather than to generalists; i.e., more neoplastic disorders to hematologists/oncologists, genitourinary to obstetrician/gynecologists and urologists, hypertensive and ischemic heart disorders to cardiologists, etc. Such reallocation of visits was based on the assumption of increased "shared-care" as well as sole or total care by the more specialized physicians.

Percent delegation to Nonphysician Providers--Modest reductions of these estimates occurred in a few specific ICDA items or groupings, usually as a corollary of reductions in the total number of visits to be provided by the generalists. The greatest changes occurred beyond the ICDA level. The Adult Panel estimates of 20 percent delegation across all morbidity conditions and 47 percent delegation of "well-care" visits were initially reduced to 12 percent and 15 percent respectively and resulted in an overall reduction of delegated visits from 22 percent to 12 percent. The reason for this reduction was that projections of the 1990 supply of nonphysician providers indicated that there would not be enough nonphysician personnel to handle all of the delegated visits. Hence the Modeling Panel reduced total delegated visits to 128.5 million, which could be met by the projected supply.

Simultaneity factors--Defined as the "average number of different conditions treated per office visit," the Modeling Panel considered special computations from the NAMCS data file and established 1.7 conditions per visit for general internal medicine and 1.5 for family practice. No estimates of this parameter were obtained from the Adult Panel since NAMCS reference data was not available for the various deliberations. Such data were available to the Internal Medicine Subspecialty Panels and explicit judgments were obtained from them for later consideration by the Modeling Panel.

Allocation of Required Visits to Family Practice vs. General Internal Medicine--Having established an estimate of total visit requirements for general adult care, it remained to allocate these visits to general/family practitioners vs. physicians in internal medicine. Since the two groups have different productivity, the total head count of required physicians is sensitive to this allocation.

To make this division, the Modeling Panel initially assumed that the projected supply of family practitioners will be fully utilized. This assumption resulted in a substantial absolute and relative projected surplus of general internists. The Modeling Panel, therefore, as part of its continuing functions to improve upon its requirements modeling process, apportioned the total number of nondelegated visits between general/family practice and physicians in general internal medicine such that the resulting percentage surplus of supply relative to requirements would be equal for the two specialties. This approach resulted in a percentage surplus of 5.1 percent for each of the two specialties. As the Adult Care Panel did not apportion out manpower requirements between allopathic general/family practice and osteopathic general practice, the Modeling Panel used the 5.1 percent supply-requirements surplus described above to further apportion and derive projected manpower requirements for the allopathic general/ family practice as well as osteopathic general practice.

Table III.A.3 summarizes the manpower requirements calculation for adult general care. See chart following Table III.A.3 which displays the distribution of manpower requirements and supply among the general internal medicine, allopathic GP/ FP, and osteopathic general practitioner specialties.

On the basis of these figures, the Committee concurred with the Modeling Panel recommendations of 81,000-87,000 family practitioners and osteopathic general practitioners and 65,000-75,000 general internists.

Table III.A.3

SUMMARY 1990 OUTPUT BASED ON ADULT MEDICAL CARE AMBULATORY DATA, AND MODELING PANEL ADJUSTMENTS FOR REQUIRMENTS OF GENERAL/ FAMILY PRACTITIONERS AND GENERAL INTERNISTS

		Before Delegation	After Delegation	% Non-Delegation
1. Adult Morbidity Visits [1]	AMC [2]	1,681,893,984	1,341,718,048	(80)
	Modeling [3]	1,059,586,948		
2. Adult Well-Care	AMC	99,555,996	52,444,675	(53)
	Modeling	35,793,898		
3. Adult Family Planning	AMC	11,209,286	5,604,643	(50)
	Modeling	4,885,573		
4. Total Adult Visits	AMC	1,792,659,266	1,399,767,366	(78)
	Modeling	1,100,266,419	971,766,419 [4]	(88)
5. Productivity: Nonhospital Visits per Year: (FP)	AMC	150 visits/ week x 46 weeks	= 6,900	
	Modeling	(120 x 46)	= 5,520	
6. Productivity: Nonhospital Visits per Year: (IM)	AMC	80 visits/ week x 45	= 3,600	
	Modeling	(80 x 46)	= 3,680	
7. Requirements before interspecialty impact:				
FP Supply Recommendations, all activities			88,250	
FP Supply: Adult Medical Care [5] [6]			62,975	
FP Adult Visits (after delegation) [7]			521,431,344	
IM Visits (after delegation)			450,335,075	
÷ Simultaneity (1.7) [3]			264,902,985	
÷ Productivity (3,680)			71,985	
x 1.031 (17 years add-on) [8]			74,216	
x 1.124 (non-patient care add-on) [9]			83,419	
- 13,183 FTE General Internist [10]			70,236	
8. 1990 Estimates				
a. Physician Supply Based on Current Practice				
Family Practice (GP/ FP) [11]			83,923	
General Internists			73,662	
b. Resulting Percent Oversupply (+) or Undersupply (-)				
Family Practice (GP/ FP) [11]				+5.1%
General Internists				+5.1%

Footnotes to Table III.A.3

1/ Includes Y-4 and Y-13 Special Examinations.

2/ AMC = Final Adult Medical Care Delphi data-base, exclusive of all adjustments.

3/ Modeling = Adjustments recommended by Modeling Panel, and accepted by GMENAC

4/ Delegation of 128,500,000 visits recommended by Modeling Panel based on potential 1990 output of nonphysician provider training resources.

5/ Previous estimate adjusted downward to account for a percent of surplus--about five percent--needed to equal the resulting supply-requirements surplus for general internal medicine.

6/ Adjusted to account for 15 percent of family practice in 1990 for patients younger than 17 years of age. Also adjusted to account for 11.8 percent of total FPs required supply in 1990: based on 8 percent teaching, 2 percent research, 1.8 percent administration.

7/ Based on a productivity of 5,520 visits per year and a reduction by a simultaneity factor of 1.5.

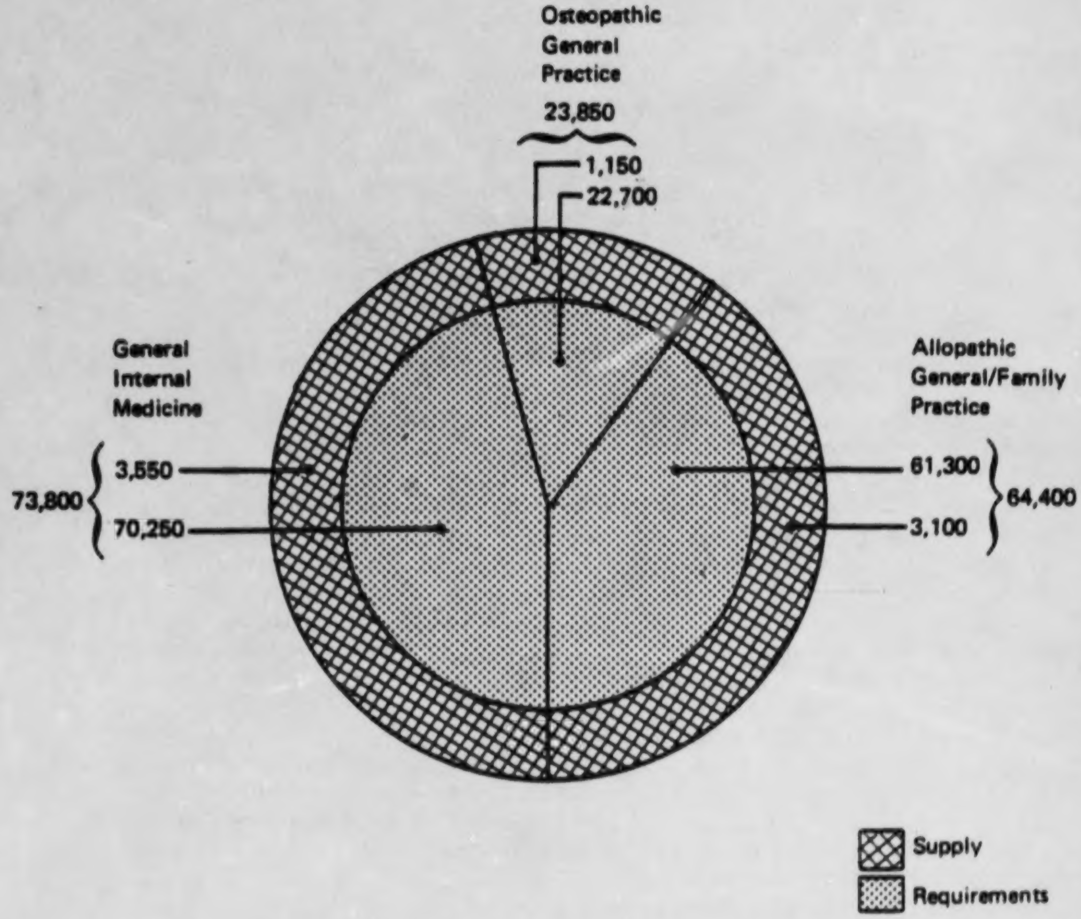
8/ Adjusted to account for 3 percent of general internal medicine practice in 1990 for patients younger than 17 years of age (equivalent to 3.1 percent increase over the 17 or older requirements.

9/ Adjusted to account for 11.0 percent of total IMs required supply in 1990: based on 3.5 percent teaching, 4.5 percent research, 3 percent administration (equivalent to 12.4 percent increase over primarily patient care physicians).

10/ Previous estimate reduced by 13,183 full-time equivalents to account for the manpower impact of the internal medicine subspecialties (4,816), general pediatrics (3,790), and the emergency medicine physicians (4,577), in adult general care.

11/ Includes osteopathic general practice.

Share of 1990 Projected Manpower Supply, Requirements, and Surpluses Among Physicians in General Internal Medicine, Allopathic General/Family Practice, and Osteopathic General Practice



Note that the difference between the inner circle (requirements) and outer circle (supply) represents an equal percentage surplus of physicians for each of the three specialties, in which projected manpower supply equals 105% of projected requirements.

B. THE SUBSPECIALTIES OF INTERNAL MEDICINE

The provision of care by the subspecialties of internal medicine was modeled in conjunction with general adult medical care. The subspecialty Delphi Panels met three times, twice in conjunction with the General Adult Care Panel. Ten subspecialties were modeled, two of which were combined:

- allergy
- cardiology
- endocrinology
- gastroenterology
- hematology/oncology
- infectious disease
- nephrology
- pulmonary disease
- rheumatology

The critical estimates are documented for each subspecialty, together with final recommendations for manpower requirements.

Because geriatrics is not currently a separately certified specialty, GMENAC has not addressed separately the need for physician manpower in geriatrics. In addition, GMENAC adopted 1990 as the target year for its analyses and recommendations, and the structure of specialty certification is unlikely to change within that period. The need of the elderly for services from each of the presently board-certified medical specialties which would be appropriate, i.e. all specialties except pediatrics and obstetrics, has been addressed by the GMENAC requirements-estimation model through its adjustment of the incidence/prevalence rates of diseases and conditions according to expected changes in the characteristics of the general population. Among those characteristics is that of age. Thus, the rate of a condition such as arthritis which is frequent among the elderly would have received a substantial upward adjustment in recognition of the greater proportion of the population expected to be elderly and therefore likely to suffer from the condition.

Manpower requirements in the internal medicine subspecialties were modeled twice, based both on ambulatory and on hospital care. The service requirements for ambulatory and hospital care are, of course, additive. Nonetheless, it is possible to estimate total manpower requirements by considering only one or the other of the service requirement components in isolation. Though this seems paradoxical at first, it is in reality quite straightforward. In order to estimate total manpower requirements using only part of the service requirements (i.e., ambulatory vs. hospital care), it is only necessary to know what proportion of the total care the "missing" element represents. Then the productivity parameter can be adjusted so that it represents only that portion of the care that could be provided in a work week divided between both components of care. For example, suppose that the average physician's time were divided between ambulatory and hospital care into the ratio 75:25. Then, the total manpower requirements can be estimated by explicitly examining only ambulatory care, so long as productivity is deflated by 75 percent.

Although this may seem an unnecessarily complicated way of generating manpower requirments, in fact it is quite useful. Manpower needs can be calculated in two different ways--one based on ambulatory care and one based on hospital care. If the two numbers are in close agreement, it provides a check on the consistency of the estimates. If they are not, it indicates that some parameters of the model may need further investigation.

All of the subspecialties except allergy estimated both an ambulatory and a hospital care requirements model. Both sets of estimates are reproduced in the following sections.

1. Allergy

According to the Allergy Delphi Panel, approximately 2,327 allergists would be required in 1990. The summary calculation based upon the ambulatory care model and data is shown in Table III.B.1. Hospital estimates were not provided, due to the small amount of hospital-based care provided by allergists.

The Modeling Panel modified the Delphi Panel judgments in two ways. First, the estimate of the proportion of patients age 16 and younger to be seen by the allergist was reduced from 20 percent to 10 percent of total patients because of the projections for pediatric allergists and their role in meeting the needs of younger allergy patients. This reduced manpower requirements by approximately 170. Second, approximately 775,000 annual visits were subtracted from adult patient care, on the grounds that pediatric allergists would continue to see a number of patients past the age of 16. This change reduced manpower requirements by about 260.

Thus, the Modeling Panel's final estimate of manpower requirements in Allergy was 1,900-2,200, and this became the Committee's recommendation.

The conditions which were the most significant manpower determinants in Allergy are shown in Table III.B.2

Major comments and issues raised by the Panel included the following:

- The future supply of allergists should be based on only those who are board-certified since current estimates are based on a large number (approximately 50%) of poorly trained allergists.

- Qualitative improvements would require the utilization of two each of highly trained allergists and immunologists in each of the 130 medical schools to improve the training of practitioners, researchers and other generalist physicians.

- Future practice will reflect a shift toward greater consultative functions and an earlier return of patients referred by family practitioners and general internists. The current practice pattern of allergists providing all continuing care for chronic conditions is due not to the preferences of allergists but to the reluctance of referring physicians to provide such care.

-- Still other qualitative improvements would be expected to emerge by 1990 in relation to immunological/pharmacological discoveries and technological advances that would be usable by other specialists and subspecialists. Thus, while increases in occupational diseases would be expected to increase, much of the increased workload might be carried by more knowledgeable and better trained occupational physicians, with only the more difficult cases having to come to the allergists. Similarly, with an anticipated greater sophistication of immunological engineering, other subspecialties would be able to share in the immunological treatment of cancer and in "bridging the immunological gap created by transplants."

Table III.B.1

ALLERGY
SUMMARY REQUIREMENTS

AMBULATORY CARE DATA (1990)	(6-11-80) Final Delphi	(7-13-80) Modeling Panel
Total Diagnostic Visits	5,437,794	5,437,794
Total, Non-Delegated Visits (97%)	5,255,789	5,255,789
Simultaneity Factor	(1.2)	(1.2)
Total Non-Delegated Patient Visits	4,379,824	
Productivity: 47 weeks x 75 visits/wk	(3,525)	(3,525)
Basic Number, Patient Care Physicians	1,243	1,243
Patients < 17 years of age (20% = 0.25 add on)	311	(10% =0.111) 138
Subtotal	1,554	1,381
General Practice (15% = .176 add-on)	273	243
Total Patient Care Allergists	1,827	1,624
Research, Teaching & Administration add-on (absolute number)	500	500
TOTAL REQUIRED ALLERGISTS	2,327	2,124

Note: Above estimates do not include impact of pediatric allergists on adult allergy care.

Table III.B.2

ALLERGY
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
493	Asthma	2,218,417	42.2	42.2
507	Hay fever	955,258	18.2	60.4
491	Chronic bronchitis	405,474	7.7	68.1
517	Other chronic interstitial pneumonia	398,261	7.6	75.6

2. Cardiology

According to the Cardiology Delphi Panel, 7,200-7,400 cardiologists would be required in 1990. The Modeling Panel made only minor revisions to the Delphi Panel estimates, reducing the care provided to children 16 and younger from 1 percent to 1/2 percent of total patients, and recognizing approximately 100,000 annual visits that will be conducted by the pediatric cardiologist. The calculations are summarized in Table III.B.3. As can be seen, the cardiologist requirements calculation was performed separately, based on ambulatory and hospital care; the results are virtually identical.

The Modeling Panel estimated 7,500-8,000 cardiologists as the number needed in 1990, and the Committee recommended this number.

The conditions which were the most significant manpower determinants in cardiology are shown in Table III.B.4.

Major comments and issues raised by the Panel included the following:

-- Cardiologists will continue to favor noninvasive diagnostic procedures over invasive ones.

-- Technological advancement in cardiology is growing at one of the fastest rates in medicine. Whether this newer technology will require more cardiologists by 1990 is not clear.

-- Chronic heart disease patients requiring ongoing care will continue to be referred to cardiologists by generlists who prefer not to treat such conditions. This will be a large source of patients for cardiologists.

-- Mortality may decrease by 1990 for certain cardiological diseases, but morbidity will remain at approximately the same level. The lowered mortality will be due to a number of factors: newer technology and epidemiological variables.

Table III.B.3

CARDIOLOGY
SUMMARY REQUIREMENTS

	(6-6-80) Final Delphi		(7-13-80) Modeling Panel
AMBULATORY CARE DATA (1990)			
Total Diagnostic Visits	16,540,827		16,540,827
Total, Non-Delegated Visits (88%)	14,529,314		14,529,314
Simultaneity Factor	(1.20)		(1.20)
Total Non-Delegated Patient Visits	12,107,761		12,107,761
Productivity: 47 weeks x 40 visits/wk	(1,880)		(1,880)
Basic Number, Patient Care Physicians	6,440		6,440
Patients < 17 years of age (1% = .010 add on)	64	(1/2% =.005)	32
Subtotal	6,504		6,472
General Practice (10% = .111 add-on)	722		718
TOTAL REQUIRED CARDIOLOGISTS	7,226		7,190
ALTERNATE METHOD OF CALCULATING:			
HOSPITAL CARE DATA (1990)			
Total Diagnostic Visits	20,812,295		20,812,295
Total, Non-Delegated Visits (75%)	15,514,210		15,514,210
Total Non-Delegated Patient Visits	15,514,210		15,514,210
Productivity: 47 weeks x 50 visits/wk	(2,350)		(2,350)
Basic Number, Patient Care Physicians	6,602		6,602
Patients < 17 years of age (1% = .010 add-on)	66	(1/2%=.005)	33
Subtotal	6,668		6,635
General Practice (10% = .111 add-on)	740		736
TOTAL REQUIRED CARDIOLOGISTS	7,408		7,371

Note: Above estimates do not include impact of pediatric cardiologist on adult cardiological care.

Table III.B.4

CARDIOLOGY
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
412	Chronic ischemic heart disease	5,554,145	38.1	38.1
410	Acute myocardial infarction	1,078,105	7.4	45.5
411	Other acute and subacute forms of ischemic heart disease	1,037,574	7.1	52.6
427	Symptomatic heart disease including arrhythmias	1,020,434	7.0	59.6
413	Angina pectoris	884,139	6.1	65.7

HOSPITAL

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
410	Acute myocardial infarction	3,876,534	25.3	25.3
411	Other acute and subacute forms of ischemic heart disease	3,887,736	18.8	44.1
412	Chronic ischemic heart disease	2,517,869	16.4	60.6
427	Symptomatic heart disease	2,217,359	14.4	74.9

3. Endocrinology

According to the Endocrinology Delphi Panel, approximately 3,100-3,200 endocrinologists would be required in 1990. The Modeling Panel made several revisions in these estimates, the most important of which were four: (1) the total number of ambulatory visits to be provided by endocrinologists was revised down to account for lower referral rates than the endocrinologists foresaw, (2) the ambulatory visit productivity was reduced from 64 to 43 visits per week, (3) the hospital visit productivity was increased from 24 to 33 visits per week, and (4) 229,000 visits were "reassigned" to the pediatric endocrinologist. The net effect of these changes was to reduce manpower requirements to approximately 1,900-2,200, which was the estimate the Modeling Panel forwarded to the Committee. The Committee recommended this number.

Table III.B.5 summarizes the endocrinology manpower requirements calculation, and Table III.B.6 displays the conditions which accounted for the major part of the endocrinology workload, both ambulatory and inpatient.

Major comments and issues raised by the Panel included the following:

-- Endocrinology continues to advance steadily from its earlier level of mere description to that of explanations of processes and system functions. As a consequence, diagnostic and therapeutic advancements will expand the general physician's capabilities for care and enable endocrinology to fulfill its responsibilities with a conservative number of highly trained physicians, strategically placed.

-- While current workloads should be reduced by returning patients sooner to their referring physicians, increased responsibilities are anticipated due to continued laboratory breakthroughs and the uncovering of new disorders, such as "silent thyroiditis."

-- A significant part of the endocrinologists' practice will continue to be the provider of comprehensive diagnostic examinations for possible endocrinological origins or relationships, all of which are considered necessary even when resulting in negative findings. Anticipated decreases in inappropriate referrals by better trained generalist physicians will probably be offset by increases in appropriate ones.

Table III.B.5

ENDOCRINOLOGY
SUMMARY REQUIREMENTS

	(6-27-80) Final Delphi		(7-13-80) Modeling Panel
AMBULATORY CARE DATA (1990)			
Total Diagnostic Visits	13,632,085		6,208,175
Total, Non-Delegated Visits	13,069,338 (96%)		5,694,123 (92%)
Simultaneity Factor	(2.0)		(2.0)
Total Non-Delegated Patient Visits	6,534,669		2,847,062
Productivity: (46 weeks x 64 visits/wk)	2,994	(46 x 43) =	1,978
Basic Number, Patient Care Physicians	2,220		1,439
Patients < 17 years of age (12%=.136 add on)	317	(6% = .064)	92
Subtotal	2,537		1,531
General Practice (22.5% = .290 add-on)	736		444
TOTAL REQUIRED ENDOCRINOLOGISTS	3,273		1,975
ALTERNATE METHOD OF CALCULATING			
HOSPITAL CARE DATA (1990)			
Total Diagnostic Visits	2,355,091		2,355,091
Total, Non-Delegated Visits (100%)	2,355,091		2,355,091
Total Non-Delegated Patient Visits			
Productivity: (46 weeks x 24 visits/wk)	1,104	(46 x 33)=	1,518
Basic Number, Patient Care Physicians	2,133		1,551
Patients < 17 years of age (12% = .136 add-on)	290	(6% = .064)	99
Subtotal	2,423		1.650
General Practice (10% = .111 add-on)	703		479
TOTAL REQUIRED ENDOCRINOLOGISTS	3,126		2,129

Note: Above estimates do not include impact of pediatric endocrinologist on adult endocrine care.

Table III.B.6

ENDOCRINOLOGY
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
245	Thyroiditis	5,412,287 (591,511)1/	41.4 (10.4)	41.4 (10.4)
241	Nontoxic nodular goiter	2,157,610 (431,444)	16.5 (7.6)	57.9 (18.0)
242	Thyrotoxicosis with or without goiter	1,039,321 (211,048)	8.0 (3.7)	65.9 (21.7)
NOS-2	Non-insulin dependent diabetes	951,110	7.3 (16.7)	73.2 (38.4)

HOSPITAL

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
250	Diabetes mellitus	840,627	35.7	35.7
251	Disorders of pancreatic internal secretin other than diabetes mellitus	662,313	28.1	63.8
240	Simple goiter	415,128	17.6	81.4

1/ ( ) Indicates Modeling Panel changes of 7/13/80.

4. Gastroenterology

The final estimates of the Gastroenterology Panel implied 7,700-8,700 gastroenterologists required in 1990. The Modeling Panel reduced total visit workload by significantly reducing the Delphi Panel's estimate of the expected referral rates from generalists for stomach ulcer and for chronic enteritis and ulcerative colitis. This, together with some minor changes reduced estimated requirements by 1,000-2,000, and the Modeling Panel estimated 6,000-7,000 gastroenterologists to be required in 1990. The Committee recommended this as the 1990 requirements estimate.

Table III.B.7 summarizes the manpower requirements calculation in gastroenterology. Table III.B.8 lists the conditions which were significant manpower determinants.

Major comments and issues raised by the Panel included the following:

-- The field of gastroenterology continues to use significantly more and better diagnostic procedures, both invasive (endoscopy) and noninvasive (CAT scanning, ultrasound, and nuclear/ radiographic). Substantial use of endoscopic procedures for therapeutic purposes appears imminent.

-- While most invasive procedures are justified, the ill-defined nature of gastrointestinal disorders and the current inadequacies of the reimbursement structure result in some degree of excess usage. Improved training of generalist physicians is expected to result in more judicious referrals as their own utilization of certain procedures.

-- Increased use of such procedures by gastroenterologists should be paralleled by an increased use of physician extenders (e.g. endoscopy assistants).

-- As a further consequence of the rapid expansion of sophisticated diagnostic procedures, gastroenterologists will need to become increasingly dependent on hospital/ institutional centers with the necessary capital and supportive talent. In relation to more nonmetropolitan areas, this may require a greater development of regional referral centers and concomitantly improved transportation systems.

Table III.B.7

GASTROENTEROLOGY
SUMMARY REQUIREMENTS

AMBULATORY CARE DATA (1990)	(6-14-80) Final Delphi	(7-13-80) Modeling Panel
Total Diagnostic Visits	11,843,114	8,080,724
Total, Non-Delegated Visits	11,250,302 (95%)	7,605,937 (94%)
Simultaneity Factor	(1.05)	(1.05)
Total Non-Delegated Patient Visits	10,714,573	7,243,750
Productivity	(1,824) 1/	(1,824)
Basic Number, Patient Care Physicians	5,874	3,971
Patients < 17 years of age (5%=.053 add on)	311 (2.5 = .026)	103
Subtotal	6,185	4,074
General Practice (20% = .250 add-on)	1,546	1,019
TOTAL REQUIRED GASTROENTEROLOGISTS	7,731	5,093

ALTERNATE METHOD OF CALCULATING

HOSPITAL CARE DATA (1990)		
Total Diagnostic Visits	10,915,498	10.915,498
Total, Non-Delegated Visits (75%)	10,913,234	10,913,234
Total Non-Delegated Patient Visits	10,913,234	10,913,234
Productivity	(1,651) 1/	(1,987)
Basic Number, Patient Care Physicians	6,610	5,492
Patients < 17 years of age (5% = .053 add-on)	350 (2.5 = .026)	143
Subtotal	6,960	5,635
General Practice (10% = .111 add-on)	1,740	1,409
TOTAL REQUIRED GASTROENTEROLOGISTS	8,700	7,044

1/ Productivity estimates based on weighted average of subgroups
Ambulatory: (Patient Care = 80% x 48 wks x 45 visits per week)+
(Academic = 20% x 48 wks x 10 visits per week)
Hospital: (Patient Care = 80% x 48 wks x 40/48 2/ visits per week)+
(Academic = 20% x 48 wks x 12/15 2/ visits per week)

2/ Delphi estimate/Modeling Panel revisions.

Table III.B.8

GASTROENTEROLOGY
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
531	Ulcer of stomach	3,361,750 (969,776)1/	28.4 (13.5)	28.4 (13.5)
C04	Composite: Benign neoplasm, digestive system (210 buccal cavity and pharynx; 211 other parts of digestive system)	1,935,135	16.3 (26.9)	44.7 (40.4)
563	Chronic enteritis and ulcerative colitis	1,495,443 (598,029)	12.6 (8.3)	57.3 (48.7)
	HOSPITAL			
153	Malignant neoplasm, large intestine except rectum	1,698,995	15.5	15.5
561	Gastroenteritis and colitis, except ulcerative, of noninfectious origin	1,034,517	9.6	25.0
531	Ulcer of stomach	678,233	6.2	31.2
NOS-A	Other Diseases of digestive system (536 Disorders of functions of stomach; 537 Stomach and duodenum; 565 Anal fissure and fistula; 566 Abscess of anal and rectal regions; 568 Peritoneal adhesions; 569 Intestines and peritoneum)	652,851	6.0	37.2
530	Diseases of esophagus	620,918	5.7	42.9

1/ ( ) Indicates Modeling Panel changes of 7/13/80.

5. Hematology/Oncology 1/

The final estimates of the Hematology/Oncology Delphi Panel implied 1990 manpower requirements of 8,700-9,300. The Modeling Panel made only minor changes in the Delphi Panel estimates (as shown in Table III.B.9) and estimated 8,900-9,100 hematologist-oncologists as required in 1990. The Committee recommended this number.

Table B.III.B.9 summarizes the manpower requirements calculation in hematology-oncology, and Table III.B.10 lists the conditions which were significant manpower determinants.

Major comments and issues raised by the Panel included the following:

-- Hematology and medical oncology, originally interrelated through the use of antitumor agents, is now sustained by the large patient population required to support hematologic practice alone. A convergence of the two independently boarded subspecialties is expected to continue into the 1990s. Unfortunately, a symbiosis also exists as a result of increased hematologic complications of oncological pharmacotherapeutics.

-- Chemotherapy treatment of malignant conditions is now at its peak but is expected to decline due to advances in immunology, biologic response modifiers, tumor antigens, and autotransplants. The major role for physician extenders will continue to be in relation to administering and supervising chemotherapy.

-- The current diffusion of oncologists to smaller population centers is desirable but occurs at the cost of devoting increasingly more time to general practice. Regional treatment centers would alleviate the problem but their development will be severely hampered by geography and transportation resources.

-- Major deficiencies in research and teaching manpower now exist at most university centers. Lack of financial, motivational, and psychosocial incentives results in too few graduates entering oncological training. This situtation is made even more devastating by poorly managed and unstimulating training programs.

1/ While in some areas these are considered separate, distinguishable subspecialties, the Delphi panelists believe that by 1990, they will, in terms of aggregate practice, not be distinguishable. However, individual practitioners may still emphasize one specialty area over the other.

Table III.8.9.

HEMATOLOGY/ONCOLOGY
SUMMARY REQUIREMENTS

	(6-27-80) Final Delphi		(7-13-80) Modeling Panel
AMBULATORY CARE DATA (1990)			
Total Diagnostic Visits	37,616,929		37,616,929
Total, Non-Delegated Visits (66%)	24,993,056		24,993,056
Simultaneity Factor	(1.65)		(1.65)
Total Non-Delegated Patient Visits	15,147,306		15,147,306
Productivity: 46 weeks x 60 visits/wk	(2,760)		(2,760)
Basic Number, Patient Care Physicians	5,488		5,488
Patients < 17 years of age (5%=.053 add on)	291	(2.5=.026)	143
Subtotal	5,779		5,631
General Practice (13% = .149 add-on)	861		839
Subtotal	6,640		6,470
Research, Teaching, Administration (23.5% = .307 add-on)	2,038		1,986
TOTAL REQUIRED HEMATOLOGISTS/ONCOLOGISTS	8,678		8,456
ALTERNATE METHOD OF CALCULATING			
HOSPITAL CARE DATA (1990)			
Total Diagnostic Visits	18,716,738		18,716,738
Total, Non-Delegated Visits (75%)	16,252,879		16,252,879
Total Non-Delegated Patient Visits	16,252,879		16,252,879
Productivity: 46 weeks x 60 visits/wk	(2,760)		(2,760)
Basic Number, Patient Care Physicians	5,889		5,889
Patients < 17 years of age (5% = .053 add-on)	312	(2.5 = .026)	153
Subtotal	6,201		6,042
General Practice (13% = .149 add-on)	924		900
Subtotal	7,125		6,942
Research, Teaching, Administration	2,187		2,132
TOTAL REQUIRED HEMATOLOGISTS/ONCOLOGISTS	9,312		9,073

Table III.B.10

HEMATOLOGY/ONCOLOGY
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
174	Malignant neoplasm of breast	6,939,628	28.0	28.0
R-16	Malignant neoplasm (161 larynx trachea, bronchus, lung)	5,724,749	23.1	51.1
153	Malignant neoplasm: rectum	2,927,936	11.8	62.9

HOSPITAL

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
190-9	Malignant neoplasm (190 eye; 191 brain; 192 other parts nervous system; 194 other endocrine glands; 195 ill-defined sites; 196 secondary and unspecified lymph nodes; 197 Secondary respiratory and digestive system; 198 Other secondary; 199 without specification of site)	3,004,250	19.2	19.2
174	Malignant neoplasm of breast	2,866,299	18.3	37.5
162	Malignant neoplasm trachea bronchus lung	1,522,948	9.7	47.2
205-9	Neoplasm (205 Meyloid leukemia; 206 Monocytic; 207 Other and unspecified leukemia; 208 Polycythemia vera; 209 Myelofibrosis)	1,485,618	9.5	56.7

6. Infectious Disease

The final estimates of the Infectious Disease Delphi Panel implied 3,600-4,400 specialists required in 1990. The Modeling Panel made three significant changes to the Delphi estimates: (1) the estimated incidence of intestinal infectious disease was reduced, as was the percentage requiring care (from 75 percent to 50 percent) and the percentage referred to the specialists from the generalist (from 30 percent to 5 percent). (2) The referral rate for "other bacterial diseases" (ICDA 030-039, except strep throat and scarlet fever) was also reduced, from 75 percent to 20 percent. (3) Ambulatory visit productivity was reduced, from 100 to 71 visits per week. The net effect of these changes was to reduce manpower requirements by about 2,000.

The Modeling Panel's estimate of the number of infectious disease specialists required in 1990 was 2,000-2,500 The Committee recommended this number.

Table III.B.11 summarizes the manpower requirements calculation in infectious disease. Table III.B.12 lists the conditions which were significant manpower determinants.

Major comments and issues raised by the Panel included the following:

-- Infectious disease physicians are mostly hospital-based, not only due to an interface with most other specialty and subspecialty direct patient care, but to such institutionally related activities as: overseeing microbiology laboratories; participating on hospital committees, infection control boards; consulting and supervising preventive programs (sanitation standards, inspections, etc.); and educating physicians and other health care professionals.

-- It was the firm conviction of this Panel that as much as 50% of infectious disease practice should involve general internal medicine. This was predicated on the perception that the infectious disease subspecialty is "type/problem/process" oriented and thus cuts across most organ systems and subspecialty practices; thus, general internal medicine skills must be maintained in order to preserve their infectious disease competency.

-- Technological advances are expected to approximate a "microbial laboratory revolution" involving more rapid and precise antibiotic sensitivities, organism identification, and blood culture analyses. Resulting from this will be greater specificity, intensity and effectiveness of therapeutic interventions. Other break-throughs are expected in relation to immunization against viral hepatitis and legionella.

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Table III.B.11

INFECTIOUS DISEASE
SUMMARY REQUIREMENTS

	(6-18-80) Final Delphi	(7-13-80) Modeling Panel
AMBULATORY CARE DATA (1990)		
Total Diagnostic Visits	8,610,990	4,868,751
Total, Non-Delegated Visits	7,725,555 (90%)	3,983,316 (82%)
Simultaneity Factor	(1.1)	(1.7)
Total Non-Delegated Patient Visits	7,023,232	2,343,127
Productivity	(3,871) 1/	(2,747)
Basic Number, Patient Care Physicians	1,814	853
Patients < 17 years of age (10%=.111 add on)	201 (5 = .053)	45
Subtotal	2,015	898
General Practice (55% = 1.222 add-on)	2,463	1,097
TOTAL REQUIRED INFECTIOUS DISEASE PHYSICIANS	4,478	1,995
ALTERNATE METHOD OF CALCULATING		
HOSPITAL CARE DATA (1990)		
Total Diagnostic Visits	12,072,320	6,746,227
Total, Non-Delegated Visits	11,503,189 (95%)	6,419,005 (95%)
Total Non-Delegated Patient Visits	11,503,189	6,419,005
Productivity	(4,987) 1/	(4,987)
Basic Number, Patient Care Physicians	2,307	1,287
Patients < 17 years of age (10% = .111 add-on)	256 (5 = .053)	68
Subtotal	2,563	1,355
General Practice (30% = .429 add-on)	1,098	581
TOTAL REQUIRED INFECTIOUS DISEASE PHYSICIANS	3,661	1,936

1/ Productivity estimates based on weighted average of subgroups
Ambulatory: (Patient Care = 80% x 48 wks x 100/71 2/ visits per week)+
(Academic = 20% x 52 wks x 3/2 2/ visits per week)
Hospital: (Patient Care = 80% x 48 wks x 125 visits per week)+
(Academic = 20% x 52 wks x 18 visits per week)

2/ Delphi estimate/Modeling Panel revisions.

Table III.B.12

INFECTIOUS DISEASE
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
R-01	Residuals; (003 Other salmonella infections; 005 Food poisoning: bacterial; 006 Amebiasis; 007 Other protozoal intestinal disease; 008 Enteritis due to other specified organism)	2,373,197 (91,230)1/	30.7 (2.3)	30.7 (2.3)
R-03	Residuals; (031 Other diseases due to mycobacteria; 035 Erysipelas; 038 Septicemia 039 Other bacterial diseases	739,700 (197,181)	9.6 (4.9)	40.3 (7.2)
R-45	Residuals; (480 Viral pneumonia; 481 Pneumococcal pneumonia; 482 Other bacterial pneumonia; 483 Pneumonia due to specified organism; 484 acute interstitial pneumonia; 845 Bronchopneumonia unspecified; 486 Pneumonia, unspecified)	407,056 (18,084)	5.3 (0.4)	45.6 (7.6)
R-44	Residuals; (471 Influenza with pneumonia; 472 Influenza with other respiratory manifestations; 473 Influenza with digestive manifestations)	371,780 (206,512)	4.8 (5.1)	50.4 (12.7)
590	Infections of kidney	363,631 (36,357)	4.7 (0.9)	55.1 (13.6)

Table III.B.12 (continued)

INFECTIOUS DISEASE
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS (cont'd)

HOSPITAL

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
480-6	(480 Viral pneumonia; 481 Pneumococcal pneumonia; 482 Other bacterial pneumonia; 483 Pneumonia due to other specified organism; 484 acute interstitial pneumonia; 845 Bronchopneumonia unspecified; 486 Pneumonia, unspecified)	2,349,689 (141,264)1/	16.0 (3.5)	32.8 (3.5)
510-19	Other diseases of respiratory system (510 Empyema; 511 Pleurisy; 512 Spontaneous Pneumothorax; 513 Abscess of lung; 514 Plumonary congestion and hypotasis; 515 Pneumonconiosis due to silica and silicates; 516 Other pneumonconiosis and related diseases; 517 Other chronic interstitial pneumonia; 518 Bronchiectasis; 519 Other diseases of respiratory system)	1,759,011 (162,872)	12.0 (4.1)	44.8 (7.6)
575	Cholecystitis and cholangitis, without mention calculus	1,004,164 (41,808)	6.8 (1.0)	58.9 (8.6)

1/ ( ) Indicates changes by Modeling Panel of 7/13/80.

7. Nephrology

The final estimates of the Nephrology Delphi Panel implied 3,900-4,100 specialists required in 1990. The Modeling Panel made three signifcant changes in the Delphi Panel's estimates based on its considered assessment of service needs to accrue to the nephrologist in 1990: (1) The proportion of patients with "other diseases of kidney and ureter"--ICDA 593--to be seen by the specialty was reduced from 100 percent to 20 percent, and the hospital visit rate was reduced. (2) The proportion of patients with hypertensive disease (ICDA 400-404) to be seen by the nephrologist was reduced from 80 percent to 20 percent. (3) Number of ambulatory visits conducted per week was raised from 50 to 75, to reflect the brief physician input required during visits to dialysis patients, especially when conducted in groups. The net effect of these changes was to reduce manpower requirements by 1,300-1,800.

The Modeling Panel estimated 2,500-3,000 nephrologists to be needed in 1990, and the Committee recommended this number.

Table III.B.13 summarizes the manpower requirements calculation in nephrology. Table III.B.14 lists the conditions which were significant manpower determinants.

Major comments and issues raised by the Panel included the following:

-- The overwhelming contribution to nephrology practice involves dialysis for patients with chronic renal failure, including those requiring long-term care and those awaiting transplants. The extent of this function is heavily reinforced and expanded by Federal reimbursement policies and procedures. Major biomedical breakthroughs in nephritis would impact heavily on this subspecialty but none appear likely within the present decade.

-- Delegability estimates of 50 percent for uremic disorders are predicated on an expanded availability and use of home and portable dialysis machines.

-- Relatively high estimates of the percent of nephrologist's practice that should be devoted to general medical care is related primarily to home visits to uremic patients. Due to the regularity of such visits over the course of time, nephrologists are in the best position, physically and psychologically, to care for other concomitant or emerging medical conditions.

Table III.B.13

NEPHROLOGY
SUMMARY REQUIREMENTS

	(6-30-80) Final Delphi		(7-13-80) Modeling Panel
AMBULATORY CARE DATA (1990)			
Total Diagnostic Visits	26,165,186		26,165,186
Total, Non-Delegated Visits	14,507,858 (55%)		14,507,858 (55%)
Simultaneity Factor	(1.90)		(1.90)
Total Non-Delegated Patient Visits	7,635,715		7,635,715
Productivity: 48 weeks x 50 visits/wk	(2,400)	(47 x75) =	(3,525)
Basic Number, Patient Care Physicians	3,182		2,166
Patients < 17 years of age (5% =.053 add on)	169	(2.5 = .026)	56
Subtotal	3,351		2,222
General Practice (20% = .250 add-on)	838		556
TOTAL REQUIRED NEPHROLOGISTS	4,189		2,778
ALTERNATE METHOD OF CALCULATING			
HOSPITAL CARE DATA (1990)			
Total Diagnostic Visits	5,735,097		3,028,494
Total, Non-Delegated Visits (100%)	5,735,097		3,028,494
Total Non-Delegated Patient Visits	5,735,097		3,028,494
Productivity: 48 weeks x 40 visits/wk	(1,920)	(47 x 40)=	(1,880)
Basic Number, Patient Care Physicians	2,987		1,611
Patients < 17 years of age (5% = .053 add-on)	158	(2.5 = .026)	85
Subtotal	3,145		1,696
General Practice (20% = .250 add-on)	786		424
TOTAL REQUIRED NEPHROLOGISTS	3,931		2,120

Table III.B.14

NEPHROLOGY
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
792	Uremia	11,434,443	78.8	78.8
R-55	Residuals; (593 Other diseases, kidney and ureter; 594 Calculus, other parts urinary system; 596 Other diseases, bladder; 599 Other diseases, urinary tract)	1,300,243	9.0	87.8

HOSPITAL

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
400-4 (15.3)	Hypertensive Disease (400 Malignant hypertension; 401 Essential benign hypertension; 402 Hypertensive heart disease; 403 Hypertensive renal disease; 404 Hypertensive heart and renal disease)	1,852,435 (463,109)1/	32.1	32.1 (15.3)
580-4	Nephritis and Nephrosis (580 Acute nephritis; 581 Nephrotic syndrome; 582 Chronic nephritis; 583 Nephritis, unqualified; 584 Renal sclerosis, unqualified)	1,200,896 (432,323)	20.8 (14.3)	52.9 (29.6)
593	Other diseases of kidney and ureter	698,703 (109,172)	12.1 (3.6)	65.0 (33.2)

1/ ( ) Indicates changes by Modeling Panel of 7/13/80.

8. Pulmonary Disease

The final estimates of the Pulmonary Disease Delphi Panel implied that 3,600-3,700 specialists would be required in 1990. The Modeling Panel made only very minor revisions to the pulmonary disease Delphi estimates, and estimated 3,500-3,700 specialists required in 1990. The Committee concurred with the Modeling Panel's estimate, and recommended this number.

Table III.B.15 summarizes the manpower requirements calculation for pulmonary disease. Table III.B.16 lists the conditions which were significant manpower determinants.

Major comments and issues raised by the Panel included the following:

- The stabilization of pulmonary disease practice around bronchitis, emphysema, and asthma has resulted in a trend toward geographic dispersion and increased practice of general medical care. The increased need for pulmonary disease physicians is based, in large part, on the anticipated 15 percent increase in these three major diseases. Contributing factors of smoking and enviromental pollution are not likely to decrease by 1990.
- The increasing emphasis on procedures and technologies (as reflected in fiberoptic bronchoscopy, sophisticated respirators, oxygen delivery systems and pulmonary function laboratory test) perpetuate the high intensity hospital-based practice for this subspecialty. The intensity of care will increase as criteria for hospital admissions are raised. This, in turn, will result in decreased use of physician extenders for hospital-based care.
- At the present time, the generalist physicians refer substantial numbers of chronic lung disease patients who could benefit from more intensive treatment by pulmonologists. Conversely, generalist referrals for bronchoscopy examinations are frequent and too often based on inadequate clinical assessments. This is complicated even more by the large numbers of bronchoscopies being performed by physicians without pulmonary training. It is considered essential that the relationships between generalist and pulmonary specialists be improved over the next decade.

Table III.B.15

PULMONARY DISEASE
SUMMARY REQUIREMENTS

	(6-24-80) Final Delphi		(7-13-80) Modeling Panel
AMBULATORY CARE DATA (1990)			
Total Diagnostic Visits	15,325,927		15,322,960
Total, Non-Delegated Visits	14,661,148 (96%)		14,658,181 (96%)
Simultaneity Factor	(1.75)		(1.75)
Total Non-Delegated Patient Visits	8,377,799		8,376,103
Productivity: 46 weeks x 60 visits/wk	(2,760)		(2,760)
Basic Number, Patient Care Physicians	3,035		3,035
Patients < 17 years of age (5% = .053 add on)	161	(2.5 =.026)	79
Subtotal	3,196		3,114
General Practice (15% = .176 add-on)	562		548
TOTAL REQUIRED PULMONARY DISEASE PHYSICIANS	3,758		3,662
ALTERNATE METHOD OF CALCULATING			
HOSPITAL CARE DATA (1990)			
Total Diagnostic Visits	8,054,582		5,091,370
Total, Non-Delegated Visits (99.9%)	8,048,212		5,085,000
Total Non-Delegated Patient Visits	8,048,212		5,085,000
Productivity: 46 weeks x 60 visits/wk	(2,760)	(46 x 37)	(1,702)
Basic Number, Patient Care Physicians	2,916		2,988
Patients < 17 years of age (5% = .053 add on)	155	(2.5 =.026)	78
Subtotal	3,071		3,066
General Practice (15% = .176 add-on)	540		540
TOTAL REQUIRED PULMONARY DISEASE PHYSICIANS	3,611		3,606

Table III.B.16

PULMONARY DISEASE
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
491	Chronic bronchitis	6,101,645	41.6	41.6
492	Emphysema	2,326,017	15.8	57.4
493	Asthma	2,266,146	15.4	72.8

HOSPITAL

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
510-19	Other Diseases respiratory systems (510 Empyema; 511 Pleurisy; 512 Spontaneous pneumothorax; 513 Abscess of lung; 514 Plumonary congestion and hypotasis; 515 Pneumonconiosis due to silica and silicates; 516 Other pneumonconiosis and related diseases; 517 Other chronic interstitial pneumonia; 518 Bronchiectasis; 519 Other diseases respiratory system)	2,265,327 (679,598)1/	28.2 (13.3)	28.2 (13.3)
480-6	(480 Viral pneumonia; 481 Pneumococcal pneumonia; 482 Other bacterial pneumonia; 483 Pneumonia due to specified organisms; 484 Other bacterial pneumonia; 845 Bronchopneumonia unspecified; 486 Pneumonia, unspecified)	1,574,266 (196,783)	19.6 (3.9)	47.8 (17.2)
162	Malignant neoplasm: trachea, bronchus lung	1,519,679	18.9 (29.8)	66.7 (47.0)

1/ ( ) Indicates changes by Modeling Panel of 7/13/80.

9. Rheumatology

The final estimates of the Rheumatology Delphi Panel implied 1,500-1,900 specialists required in 1990. Again, the Modeling Panel made only very minor revisions to these estimates.

The Modeling Panel estimated 1,500-1,900 rheumatologists as required in 1990. The Committee accepted the Modeling Panel's estimate, and recommended this number.

Table III.B.17 summarizes the manpower requirements calculation for rheumatology. Table III.B.18 lists the conditions which were significant manpower determinants.

Major comments and issues raised by the Panel included the following:

-- Rheumatology is primarily a patient-contact subspecialty with relatively few occasions for procedures or sophisticated technology. Due to the uncertainties of many rheumatic/arthritic conditions, most physicians tend not to refer such patients and thereby prevent them from receiving better quality care. Hopefully, generalists will be better trained regarding rheumatologic disorders by 1990.

-- Major advances are needed to address the fundamental disease processes of most rheumatology patients. Increased knowledge concerning immunological mechanisms would have a major impact on rheumatoid arthritis and collagen/connective tissue disorders, particularly in view of anticipated increases due to the aging populations. Unfortunately, current technological and biomedical developments do not promise to impact significantly on manpower needs during the next decade. It is more likely that substantial shifts from hospital to ambulatory care will occur for many conditions.

-- Due to the absence of "glamour" and other diverse disincentive factors, many training programs and academic departments in rheumatology are now languishing; the result is inadequate training, research and career development.

Table III.B.17

RHEUMATOLOGY
SUMMARY REQUIREMENTS

	(6-30-80) **Final Delphi**	(7-13-80) **Modeling Panel**
AMBULATORY CARE DATA (1990)		
Total Diagnostic Visits	6,614,893	6,614,893
Total, Non-Delegated Visits (89%)	5,863,889	5,863,889
Simultaneity Factor	(1.25)	(1.25)
Total Non-Delegated Patient Visits	4,691,111	4,691,111
Productivity	(3,526) 1/	(3,526)
Basic Number, Patient Care Physicians	1,330	1,330
Patients < 17 years of age (5% =.053 add on)	71	(2.5 =.026) 35
Subtotal	1,401	1,365
General Practice (25% = .333 add-on)	466	454
TOTAL REQUIRED RHEUMATOLOGISTS	1,867	1,819
ALTERNATE METHOD OF CALCULATING		
HOSPITAL CARE DATA (1990)		
Total Diagnostic Visits	1,562,036	1,562,036
Total, Non-Delegated Visits (100%)	1,562,036	1,562,036
Total Non-Delegated Patient Visits	1,562,036	1,562,036
Productivity	(1,448) 1/	(1,448)
Basic Number, Patient Care Physicians	1,079	1,079
Patients < 17 years of age (5% = .053 add-on)	57	28
Subtotal	1,136	1,107
General Practice (25% = .333 add-on)	378	369
TOTAL REQUIRED RHEUMATOLOGISTS	1,514	1,476

1/ Productivity estimates based on weighted average of subgroups
Ambulatory: (Patient Care = 78% x 47 wks x 90 visits per week) +
(Academic = 22% x 47 wks x 22 visits per week)
Hospital: (Patient Care = 78% x 47 wks x 35 visits per week) +
(Academic = 22% x 47 wks x 16 visits per week)

Table III.B.18

RHEUMATOLOGY
MAJOR CONTRIBUTORS TO NON-DELEGATED VISITS

AMBULATORY

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
717	Other nonarticular rheumatism	2,342,073	39.9	39.9
712	Rheumatoid arthritis and allied condition	764,671	13.0	52.9
731	Synovitis, bursitis and tenosynovitis	552,572	9.4	62.3
734	Diffuse diseases, connective tissue	440,076	7.5	69.8

HOSPITAL

ICDA	Diagnosis	Post-Del Visits	% of Total	Cumul %
712	Rheumatoid arthritis and allied condition	367,775	24.1	24.1
734	Diffuse diseases, connective tissue	233,941	15.3	39.4
717	Other nonarticular rheumatism	137,947	9.0	48.4
725	Displacement intervertebral disc	135,341	8.9	57.3
446	Polyarteritis nodosa and allied conditions	126,749	8.3	65.6

C. CHILD CARE

1. General Pediatrics

Overview--The 10 members of the Child Medical Care Delphi Panel met at three meetings lasting two days each between June and October 1979 to estimate child medical care requirements in 1990. The first meeting consisted primarily of an orientation to GMENAC and an explanation given to the panelists of the generic model and data sources that were to be utilized. Toward the end of the first meeting, the members were given a package consisting of seven questions pertaining to the generic model on 230 diseases to which to respond based on empirical data, personal knowledge, and expertise. The second and third meetings involved reviewing the members' responses in an attempt to reduce the variance. In addition to discussing specific questions pertaining to each of the 230 diseases, the Panel also made judgments of the percent of nonpatient care activities in which physicians are involved, the percentage of a pediatrician's practice for patients 17 years of age and older, and expectations for changes in physician productivity in 1990. What follows is a summary of these responses, highlighting special issues impacting on general pediatrician manpower requirements.

ICDA and Diagnosis--The Panel chose to respond basically to the three-digit level of ICDA disaggregation as contained in the reference material provided them. Consequently, the Panel responded to 230 specific ICDAs or ICDA groups comprising the ambulatory care service needs for pediatrics. Among the three-digit ICDAs that the Panel chose to combine into groupings for its deliberations were inflammatory diseases of the ear, pneumonia, bronchitis, certain diseases of the respiratory system, appendicitis, certain diseases of the urinary system, arthritis and rheumatism, superficial injuries and contusions, and adverse effects of substances. For the detailed responses to those ICDAs and ICDA groups having a significant impact on pediatrics requirements see Table III.C.3, "Ambulatory Care Service Requirements for Pediatric Morbidity Conditions Impacting Significantly on Manpower Requirements" on pp. 75-80.

1977 Adjusted Incidence - Prevalence Rates--For the most part the Panel seemed to agree with the incidence-prevalence rates derived primarily through the U.S. Health Interview Survey (HIS) and National Ambulatory Medical Care Survey (NAMCS) 1/. When rates were adjusted, they were usually increased due to a perceived undercount in the surveys' reported rates per 100,000. Notable upward adjustments of rates having significant implications for pediatric manpower requirements were for the morbidities of the intestinal infectious diseases including enteritis and diarrheal diseases, and diseases of the respiratory system including pharyngitis, tonsillitis, bronchitis, and hay fever. In the area of

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1/ When morbidity rates from the HIS were unavailable, the number of "first visits" annually as taken from NAMCS was used as a proxy for morbidity.

mental disorders, the Panel revised the reported rates significantly upward. The manpower implications of this adjustment for pediatricians, however, seemed to be minor due to the relatively small proportion of such cases that should be seen by pediatricians versus child psychiatrists.

Percentage Change in Rate to 1990--For the vast majority of morbidities, the Panel did not foresee any change in the incidence rate to 1990. For those morbidities in which a change was predicted, the change was usually a projected decline due to public health measures or a change in lifestyle.

Percent Requiring Health Care in 1990--In about one-half of the morbidities reviewed, the Panel felt that all persons with the morbidity will require health care in 1990. For the other one-half of the morbidities the Panel generally estimated that between 50 and 95 percent will require health care. The HIS was used as a reference for this question; HIS shows the current percent of persons with each condition that actually seek care.

Percent Requiring Care that Should be Seen by Pediatrician or General/Family Practitioner (GP/FP) in 1990--For the overwhelming majority of morbidities reviewed, the percent requiring health care that should be seen during some stage of the illness by the pediatrician or GP/FP was given as at or near 100 percent. NAMCS was the reference utilized, which shows the percent of visits handled by a pediatrician compared to a GP/FP.

Norms of Care--The norms of care, as defined for the Panel, included the average number of needed visits per person per episode for the incidence of acute conditions and the average number of visits needed per year for the prevalence of chronic conditions. With few exceptions, the Panel's median responses were within the range of the current norms of care generated by the National Ambulatory Medical Care Survey, the University of Southern California - Mendenhall Survey, and the Yale-Schonfeld study.

Percent of Visits that Should be Delegated to Nonphysician Health Care Providers in 1990--After much discussion, the Panel chose to endorse the medians of the Panel's responses for each morbidity condition concerning the percent of visits that should be delegated to nonphysician providers, with the following restrictions as to interpretation:

- The medians represent the percentages of "visit equivalents" or visits shared between the physician and the nonphysician provider, rather than total visits delegated.

- The medians represent percentages of visits that should be delegated in 1990 provided that "adequate" supplies of nonphysician health care providers are available by then.

- The nonphysician health care provider should be functioning under the supervision of the physician.

The Panel's median responses ranged from 0 to 50 percent across morbidity conditions, the percentages depending, of course, on the severity and complexity of treatment.

Task Delegation--In addition to the visit delegation, the Panel felt that the percentage of task delegation could be increased by 5 percent between now and 1990 based on improved organizational efficiencies. This increase was reflected in the Panel's estimate of 1990 productivity.

Well-Child Care--The consensus of the Panel was that a child through the age of 16 should see a general pediatrician on an average of once a year for "well-child care," including the need for prophylactic innoculations and vaccinations. The Panel used as its benchmark the well-care protocols developed by the American Academy of Pediatrics (AAP) and Breslow-Somers. 1/ The AAP protocol results in a greater number of visits than that of Breslow-Somers--three visits every four years per child. The Panel felt that these protocols were too low as they are based on an "intact" family with two parents, and should be expanded. It was felt that the needs for a high concentration of well-care visits in the first year of life will increase the average to one well-care visit per year for each of the first 16 years of life. The Panel estimated that approximately 20 percent of well-child care should be delegated in 1990 based on the need for the high concentration of the well-care visits in the first year of life. The well-child care visits resulted in approximately 18 percent of all the visits before delegation to the child medical care practitioner.

Number of Weeks Worked per Year, 1990--The median of the panel members' responses to this question was 46 weeks, a decrease from the 1976 average of 47.3 weeks worked per year by the pediatrician (derived from the AMA data). The Panel felt that a projected decline will occur based on trends in lifestyle and the tendency toward group practice, and will mirror the general trend throughout the economy towards shorter work weeks.

Number of Nonhospital Visits Per Week to Pediatrician, 1990--Hospital care accounts for a relatively minor portion of the average practicing pediatrician's practice (the Panel estimated that in 1990 less than 20 percent of the practicing pediatrician's hours spent in direct patient care will be in the hospital). The Panel chose not to deal with hospital care requirements for pediatricians explicitly. Rather, the Panel estimated the number of nonhospital visits per week that should be handled by the average practicing pediatrician, giving sufficient time for him/her to spend in hospital care activities. The median number of 1990 nonhospital visits per week was estimated by the Panel as 127.5, slightly higher than 122.7 reported in 1976 by the AMA.

Percentage of Pediatrician's Practice for Patients over 16 Years of Age--It should be noted that the morbidity-based material provided as reference as well as the Panel's condition-related responses referred to

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1/ Sources cited in Reference section.

the total child population in the United States ages 0-16. The Panel therefore chose to develop pediatric requirements for all ages by adding on to the estimates derived for the population ages 0-16 the percentage of the pediatrician's practice in 1990 that should be devoted to patients 17 years of age and older. The Panel's median was 7 percent, which represents a 30 percent increase over the current 5.4 percent of a pediatrician's patients above the age of 16 as reported by the USC Mendenhall Study. It was felt that the increasing role of the pediatrician in adolescent medicine will account for this increase.

Percent of Pediatrician Care Accruing to the GP/FP in 1990--In each of the previous responses, the Panel derived estimates for child medical care without differentiating between the general pediatrician and the general/family practitioner. In effect, it derived combined requirements for these specialists for child care. After much deliberation as to how to separate child medical care requirements between the general pediatrician and general/family practitioner, the Panel chose not to differentiate between the two based on training criteria or by morbidity condition, since the Panel felt that this would prove to be an impossible undertaking. Rather, the Panel chose to adopt "a supply-driven" model in which the current proportions of the general pediatricians' practice as well as the GP/FP's practice devoted to child care are meshed with the supplies of the two respective specialties to obtain numbers of "full-time equivalent" child medical care practitioners. Using the current supply of pediatricians and GP/FPs, the percent of all child care accruing to the GP/FP aggregate specialty is 32 percent. This percentage declines to 25 percent if the 1990 projected supplies of general pediatricians and GP/FPs as developed from the SOAR (see Supply of Health Manpower 1970, Profiles and Projections to 1990, 1974) model are utilized. The Panel chose to accept the application of this "supply-driven" methodology utilizing 1990 projections from the supply model to be adopted by GMENAC that was not as yet available for the Panel's deliberations[1]. It was the Panel's understanding, however, that the recent growth in family practitioner training programs will moderate by 1990.

Percent of Pediatricians Who Should be Active, Nonpracticing Pediatricians in 1990--It should be noted that the resulting requirements of pediatricians based on service needs and health care productivity refer to the average "clinical practicing" pediatrician, defined to include those pediatricians primarily engaged in patient care activities. The Panel chose to estimate "nonclinical" pediatricians--those engaged primarily in teaching, research, and administration--as a percentage "add-on" to the manpower requirements for the practicing pediatrician. Based on trend data from the AMA provided to the Panel, as well as the Panel's views of the future of pediatrics, the Panel felt that in 1990, 10 percent of active pediatricians should be engaged primarily in nonpatient-care activities.

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[1] It should be noted that the supply projections emanating from the SOAR model were not endorsed by GMENAC. The Office of Graduate Medical Education has developed its own supply projections model under contract which utilizes GMENAC assumptions.

Requirements for 1990--The estimates of the Child Medical Care Panel led to a requirement for 38,965 general pediatricians in 1990. For a detailed display of the components of the pediatric requirements see Table III.C.1, "Pediatric Manpower Requirements Derived from Delphi Panel Responses." Note that these requirements do not take into account the impact of physician specialties as well as Modeling Panel revisions.

Modeling Panel Review--On March 1, 1980 the Modeling Panel reviewed the responses of the Child Medical Care Delphi Panel. It recommended eight changes to the following diseases and disease groups:

1. ICDA Group: ICDA 380, Otitis externa, ICDA 381, Otitis media without mention of mastoiditis, and ICDA 384, Other inflammatory diseases of ear -- decreased percent requiring health care that should be seen by Ped/GP/FP in 1990 from 100 percent to 95 percent.

2. ICDA Group: ICDA 623, Uterovaginal prolapse, ICDA 626, Disorders of menstruation, and ICDA 629, Other diseases of female genital organs -- decreased percent requiring health care that should be seen by Ped/GP/FP in 1990 from 100 percent to 80 percent.

3. ICDA Disease 692, Other eczema and related conditions -- decreased 1990 norms of care for Ped/GP/FP from 3.5 visits to 2.5 visits.

4. ICDA Disease 706, Diseases of sebaceous glands -- decreased 1990 norms of care for Ped/GP/FP from 4.0 visits to 2.0 visits.

5. ICDA Disease 746, Congenital anomalies of heart -- decreased 1990 norms of care for Ped/GP/FP from 6.0 visits to 3.0 visits.

6. ICDA Disease 873, Other and unspecified laceration of head -- decreased percentage requiring health care that should be seen by Ped/GP/FP in 1990 from 90 percent to 70 percent.

7. ICDA Group: ICDA 910, Superficial injury of face, neck, and scalp, and other (911-918) -- decreased percent requiring health care from 80 percent to 75 percent.

8. ICDA Group: ICDA 965-989, Adverse effect of medicinal agents and toxic effect of substances chiefly nonmedicinal as to source -- decreased 1990 norms of care for Ped/GP/FP from 2.5 visits to 2.0 visits.

Table III.C.1

PEDIATRIC MANPOWER REQUIREMENTS DERIVED FROM DELPHI PANEL RESPONSES

		Before Delegation	After Delegation
1.	Number of Child Morbidity Visits	285,476,485	203,798,714
2.	Number of Child Well-Care Visits	64,211,419	51,329,374
3.	Sum of Child Visits	349,687,904	255,128,088
4.	Number of Nonhospital Visits per Pediatrician per Year	5,584	5,865[1]
5.	Number of General Pediatricians and GP/FPs Required for Child Medical Care Activities	67,320	46,763
6.	Number of Patient-Care General Pediatricians Required[3]	50,490	35,072
7.	Number of Total Active General Pediatricians Required[4]	56,094	38,965

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[1] Adjusted to account for Panel's estimate of 5 percent potential for increased task delegability in 1990.

[2] Accounts for Panel's estimate of 7 percent of pediatrician's practice in 1990 for patients 17 years of age and older.

[3] Previous estimates reduced by 25 percent to account for child-care requirements accruing to GP/FP in 1990.

[4] Accounts for Panel's estimate of 10 percent of pediatricians who should be engaged in nonpatient care activities.

NOTE: These requirements do not take account of the impact of other physician specialties as well as Modeling Panel revisions.

The Modeling Panel also made the following revisions:

-- The Child Care Panel developed morbidity condition-specific visits without accounting for the possibility of multiple conditions that could be handled by the pediatrician in any one visit. The Modeling Panel, therefore, recommended a 25 percent reduction in the number of visits accruing to the child care specialty. This was based on data derived from the National Ambulatory Medical Care Survey that indicated that the average general pediatrician currently handles 1.317 conditions per visit.

-- The Modeling Panel corrected the child manpower requirements in order to account for care that general internists and FP/GPs provide to children. In doing this, the Modeling Panel accepted the Adult Medical Care Delphi Panel's estimate that fifteen percent of GP/FPs required in 1990 should provide care solely for children. Furthermore, the Modeling Panel estimated that 3 percent of general internists required in 1990 should provide care solely for children. This latter figure represents a decrease from the Adult Medical Care Delphi Panel's original estimate of 5 percent. Thus, the total number of general pediatricians required in 1990 was reduced to account for the care provided children by FP/GPs and general internists.

-- Based on the anticipated supply of nonphysician health care providers available in 1990 for child medical care, the Modeling Panel estimated that only 15 percent of all pediatric visits could be handled by the nonphysician health care provider supply.

-- Emergency physicians working in emergency rooms provide a substantial amount of general medical care. Approximately six million annual visits were subtracted from the general pediatricians' workload to account for this impact. The calculation of this total was based on total projected visits to emergency rooms for:

    -- accidents, poisonings, and violence
    -- all other conditions

    The USC-Mendenhall data were used to estimate the proportion of patients in each class that were aged 16 or younger. Then, (1) the excess of emergency room visits for accidents, poisonings, and violence over total child first visits for these conditions which the child care panelists had said would be handled by physicians other than general pediatricians was subtracted from the general pediatricians workload; and (2) all emergency room visits for "other conditions" was subtracted from the general pediatricians' workload. The total of these items was, as noted, about six million annual visits.

As a result of these revisions and after considerable deliberations, the Modeling Panel recommended 29,000-31,500 general pediatricians to be required in 1990. The GMENAC Committee adopted this recommendation. For a detailed display of the modeling components of the requirements, see Table III.C.2, "Summary Output of the Child Medical Care Delphi Process as Revised by the Modeling Panel."

Table III.C.2

SUMMARY OUTPUT OF THE CHILD MEDICAL CARE DELPHI PROCESS AS REVISED BY THE MODELING PANEL

		After 15.0% Delegation
1.	Number of Child Morbidity Visits	237,650,121
2.	Number of Child Well-Care Visits	51,329,374
3.	Sum of Child Visits	288,979,495
4.	Sum of Child Visits [1]	219,422,547
5.	Number of Nonhospital Visits per Child Medical Care Practitioner per Year	5,865 [2]
6.	Number of General Pediatricians and GP/FPs Required for Child Medical Care Activities	37,412
7.	Number of Patient-Care General Pediatricians Required for Child Care [3]	26,299
8.	Number of Patient-Care General Pediatricians Required [4]	28,271
9.	Number of Total Active General Pediatricians Required [5]	31,410
10.	Number of Total Active General Pediatricians Required [6]	28,712

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[1] Adjusted by Modeling Panel to account for a simultaneity factor of 1.317 conditions per visit.

[2] Adjusted to account for the Child Medical Care Panel's estimate of 5 percent potential for increased task delegability in 1990.

[3] 37,412 general pediatricians has been reduced by 11,113 full-time equivalent (FTE) GP/FPs engaged in child patient care activities in 1990. Based on Modeling Panel's recommendation that 15 percent of projected requirements of FTE patient care GP/FPs to be engaged in child medical care.

[4] Accounts for Child Medical Care Panel's estimate of 7 percent of General Pediatrician's practice in 1990 for patients 17 years of age and older.

[5] Includes Child Medical Care Panel's estimate of 10 percent of general pediatricians who should be engaged in nonpatient care activities in 1990.

[6] The Modeling Panel reduced the estimate of 31,410 pediatricians by 2,698 pediatricians due to the manpower impact of the adult medical care specialty (equivalent to 1,552 pediatricians) and the emergency medicine specialty (equivalent to 1,146 pediatricians) on child care.

Table III.C.3

AMBULATORY CARE SERVICE REQUIREMENTS FOR PEDIATRIC MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS a/

	1	2	3	4	5	6	7	8	9
ICDA & Diagnosis	Reference 1977 Rate per 100,000 b/	1977 Rate per 100,000	% Rate Change 1977 to 1990	% Requiring Health Care in 1990	% (0-16) Requiring Health Care that Should be Seen by Pediatrician/ GP/ FP in 1990	1990 Norms of Care (Visits) for Pediatrician/ GP/ FP	Pre-Delegation Number of Visits	% of Visits that Should be Delegated to NP Health Care Provider in 1990 1/	% of Total Child Morbidity Visits in 1990 2/
Infective and Parasitic Diseases	.								
008 Enteritis due to other specified organism	7,877	10,000	0	50	90	1.2	3,324,187	43	1.2
034 Streptococcal sore throat and scarlet fever	6,041	6,479	0	100	100	1.9	7,577,975	50	2.7
079 Other viral disease	18,382	19,250	0	50	80	1.6	7,584,070	30	2.8
Diseases of the Blood and Blood-Forming Organs									
--Other	1,074	1,074	0	100	100	3.0	1,983,429	0	0.7
(281 Other deficiency anemias)									
(283 Acquired hemolytic anemias)									
(284 Aplastic anemia)									
(285 Other and unspecified anemias)									
(286 Coagulation defects)									
(287 Purpura and other hemorrhagic conditions)									
Diseases of Ear and Mastoid Process									
380 Otitis externa	76								
381 Otitis media without mention of mastoiditis	13,184	18,000	0	100	95 3/	2.0	21,053,184	25	7.6
384 Other inflammatory diseases of ear	3,847								
387 Other diseases of ear and mastoid process	1,758	1,758	0	100	100	2.0	2,164,414	0	0.8
460 Acute nasopharyngitis (common cold)	72,241	72,241	0	40	100	1.5	26,682,510	63	9.7
462 Acute pharyngitis	18,250	23,500	0	50	100	1.5	10,849,777	50	3.9
463 Acute tonsillitis	5,080	9,000	0	100	100	1.5	8,310,467	50	3.0
466 Acute bronchitis and bronchiolitis	5,642	10,000	0	90	100	2.8	15,512,873	25	5.6
470 Influenza, unqualified	43,172	43,172	0	50	100	1.5	19,932,194	25	7.2

a/ b/ See footnotes at end of table.

1/ This column is the result of the Child Medical Care Delphi Panel. The sum of delegated visits for approximately 230 morbidity conditions amounted to 28.8 percent of all visits. GMENAC endorsed a 15 percent delegation rate for the aggregate of morbidity conditions accruing to the Child Medical Care specialty, based on the projected supply of nonphysician child health care providers. However, rates of delegation vary significantly by morbidity.

2/ Each morbidity condition or group of conditions requires ambulatory visits comprising at least 0.7 percent, and sums to 73.1 percent, of the total number of ambulatory morbidity visits accruing to child medical care practitioners in 1990.

3/ Modeling Panel, Child Care Panel 100 percent.

Note: Columns 2, 3, 4, 5, 6, 8, and 10 represent the responses of the Child Medical Care Delphi Panel.

Table III.C.3 (Continued)

AMBULATORY CARE SERVICE REQUIREMENTS FOR PEDIATRIC MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS A/

ICDA & Diagnosis	1 Reference 1977 Rate per 100,000 B/	2 1977 Rate per 100,000	3 % Rate Change 1977 to 1990	4 % Requiring Health Care in 1990	5 % (0-16) Requiring Health Care that Should be Seen by Pediatrician/ GP/FP in 1990	6 1990 Norms of Care (Visits) for Pediatrician/GP/FP	7 Pre-Delegation Number of Visits	8 % of Visits that Should be Delegated to NP Health Care Provider in 1990 1/	9 % of Total Child Morbidity Visits in 1990 2/
483 Pneumonia due to other specified organism	81								
485 Bronchopneumonia, unspecified	82	2,069	0	100	100	3.0	3,820,956	10	1.4
486 Pneumonia, unspecified	1,906								
490 Bronchitis, unqualified	3	4,424	0	100	100	3.0	8,170,112	25	3.0
491 Chronic bronchitis	4,421								
493 Asthma	3,157	3,157	0	100	100	5.0	9,717,088	28	3.5
503 Chronic sinusitis	2,923	2,923	0	75	100	2.0	2,699,054	20	1.0
507 Hay fever	3,490	5,000	0	75	100	4.0	9,233,853	50	3.3
Other Diseases of Respiratory System									
512 Spontaneous pneumothorax	-								
519 Other diseases of respiratory system	639	1,500	0	100	100	2.0	1,846,770	5	0.7
--Other	724								
(510 Empyema)									
(511 Pleurisy)									
(513 Abscess of lung)									
(514 Pulmonary congestion and hypostasis)									
(517 Other chronic interstitial pneumonia)									
(518 Bronchiectasis)									
Diseases of Esophagus, Stomach, and Duodenum									
536 Disorders of function of stomach	6,586	6,586	0	50	70	1.5	2,128,495	10	0.8
--Other	390	800	0	100	100	4.5	2,216,124	10	0.8
(530 Diseases of esophagus)									
(531 Ulcer of stomach)									
(532 Ulcer of duodenum)									
(533 Peptic ulcer, site unspecified)									
(537 Other diseases of stomach & duodenum)									

A/B/ See footnotes at end of table.

1/ This column is the result of the Child Medical Care Delphi Panel. The sum of delegated visits for approximately 230 morbidity conditions amounted to 28.8 percent of all visits. GMENAC endorsed a 15 percent delegation rate for the aggregate of morbidity conditions accruing to the Child Medical Care specialty, based on the projected supply of nonphysician child health care providers. However, rates of delegation vary significantly by morbidity.

2/ Each morbidity condition or group of conditions requires ambulatory visits comprising at least 0.7 percent, and sums to 73.1 percent, of the total number of ambulatory morbidity visits accruing to child medical care practitioners in 1990.

Note: Columns 2, 3, 4, 5, 6, 8, and 10 represent the responses of the Child Medical Care Delphi Panel.

Table III.C.3 (Continued)

AMBULATORY CARE SERVICE REQUIREMENTS FOR PEDIATRIC MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS a/

ICDA & Diagnosis	1 Reference 1977 Rate per 100,000 b/	2 1977 Rate per 100,000	3 % Rate Change 1977 to 1990	4 % Requiring Health Care in 1990	5 % (0-16) Requiring Health Care that Should be Seen by Pediatrician/ GP/ FP in 1990	6 1990 Norms of Care (Visits) for Pediatrician/ GP/ FP	7 Pre-Delegation Number of Visits	8 % of Visits that Should be Delegated to NP Health Care Provider in 1990 1/	9 % of Total Child Morbidity Visits in 1990 2/
Nephritis and Nephrosis									
--Other	9								
(581 Nephrotic syndrome)									
(583 Nephritis, unqualified)									
(584 Renal sclerosis, unqualified)									
		1,100	0	100	100	4.0	2,708,596	5	1.0
Other Diseases of Urinary System									
590 Infections of kidney	821								
593 Other diseases of kidney and ureter	28								
Diseases of Uterus and Other Female Genital Organs									
--Other	2,220	2,220	0	100	80 3/	2.0	2,186,575	20	0.8
(623 Uterovaginal prolapse)									
(626 Disorders of menstruation)									
(629 Other diseases of female genital organs)									
692 Other eczema and dermatitis	3,711	3,711	0	100	100	2.5 4/	5,711,136	25	2.1
783 Symptoms referable to respiratory system	1,970	1,970	0	95	100	2.0	2,304,153	25	0.8
788 Other general symptoms	8,414	8,414	0	75	100	1.5	5,827,022	15	2.1
873 Other and unspecified laceration of head	6,856	6,856	0	100	70 5/	2.4	7,090,417	0	2.6

a/ b/ See footnotes at end of table.

1/ This column is the result of the Child Medical Care Delphi Panel. The sum of delegated visits for approximately 230 morbidity conditions amounted to 28.8 percent of all visits. GMENAC endorsed a 15 percent delegation rate for the aggregate of morbidity conditions accruing to the Child Medical Care specialty, based on the projected supply of nonphysician child health care providers. However, rates of delegation vary significantly by morbidity.

2/ Each morbidity condition or group of conditions requires ambulatory visits comprising at least 0.7 percent, and sums to 73.1 percent, of the total number of ambulatory morbidity visits accruing to child medical care practitioners in 1990.

3/ Modeling Panel, Child Care Panel 100 percent.

4/ Modeling Panel, Child Care Panel 3.5 visits.

5/ Modeling Panel, Child Care Panel 90 percent.

Note: Columns 2, 3, 4, 5, 6, 8, and 10 represent the responses of the Child Medical Care Delphi Panel.

Table III.C.3 (Continued)

AMBULATORY CARE SERVICE REQUIREMENTS FOR PEDIATRIC MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS A/

ICDA & Diagnosis	1 Reference 1977 Rate per 100,000 B/	2 1977 Rate per 100,000	3 % Rate Change 1977 to 1990	4 % Requiring Health Care in 1990	5 % (0-16) Requiring Health Care that Should be Seen by Pediatrician/GP/FP in 1990	6 1990 Norms of Care (Visits) for Pediatrician/GP/FP	7 Pre-Delegation Number of Visits	8 % of Visits that Should be Delegated to NP Health Care Provider in 1990 1/	9 % of Total Child Morbidity Visits in 1990 2/
910 Superficial injury of face, neck, and scalp	852	3,400	0	75 3/	90	1.5	2,119,169	10	0.8
--Other	2,563								
(911 Superficial injury of trunk)									
(912 Superficial injury of shoulder and upper arm)									
(913 Superficial injury of elbow, forearm, and wrist)									
(914 Superficial injury of hand(s), except finger(s) alone)									
(915 Superficial injury of finger(s))									
(916 Superficial injury of hip, thigh, leg, and ankle)									
(917 Superficial injury of foot and toe(s))									
(918 Superficial injury of other, multiple, and unspecified sites)									

A/3/ See footnotes at end of table.

1/ This column is the result of the Child Medical Care Delphi Panel. The sum of delegated visits for approximately 230 morbidity conditions amounted to 28.8 percent of all visits. GMENAC endorsed a 15 percent delegation rate for the aggregate of morbidity conditions accruing to the Child Medical Care specialty, based on the projected supply of nonphysician child health care providers. However, rates of delegation vary significantly by morbidity.

2/ Each morbidity condition or group of conditions requires ambulatory visits comprising at least 0.7 percent, and sums to 73.1 percent, of the total number of ambulatory morbidity visits accruing to child medical care practitioners in 1990.

3/ Modeling Panel 3/1/80, Child Care Panel 80 percent.

Note: Columns 2, 3, 4, 5, 6, 8, and 10 represent the responses of the Child Medical Care Delphi Panel.

Table III.C.3 (Continued)

AMBULATORY CARE SERVICE REQUIREMENTS FOR PEDIATRIC MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS A/

ICDA & Diagnosis	1 Reference 1977 Rate per 100,000 B/	2 1977 Rate per 100,000	3 % Rate Change 1977 to 1990	4 % Requiring Health Care in 1990	5 % (0-16) Requiring Health Care that Should be Seen by Pediatrician/ GP/ FP in 1990	6 1990 Norms of Care (Visits) for Pediatrician/ GP/ FP	7 Pre-Delegation Number of Visits	8 % of Visits that Should be Delegated to NP Health Care Provider in 1990 1/	9 % of Total Child Morbidity Visits in 1990 2/
Contusion and Crushing with Intact Skin Surface		7,000	0	68	100	1.5	4,395,314	20	1.6
920 Contusion of face, scalp and neck except eye(s)	1,181								
927 Contusion of hip, thigh, leg and ankle	1,830								
--Other	3,907								
(921 Contusion of eye and orbit)									
(922 Contusion of trunk)									
(923 Contusion of shoulder and upper arm)									
(924 Contusion of elbow, forearm, and wrist)									
(925 Contusion of hand(s), except finger(s) alone)									
(926 Contusion of finger(s))									
(928 Contusion of foot and toe(s))									
(929 Contusion of other, multiple, and unspecified sites)									

A/ B/ See footnotes at end of table.

1/ This column is the result of the Child Medical Care Delphi Panel. The sum of delegated visits for approximately 230 morbidity conditions amounted to 28.8 percent of all visits. GMENAC endorsed a 15 percent delegation rate for the aggregate of morbidity conditions accruing to the Child Medical Care specialty, based on the projected supply of nonphysician child health care providers. However, rates of delegation vary significantly by morbidity.

2/ Each morbidity condition or group of conditions requires ambulatory visits comprising at least 0.7 percent, and sums to 73.1 percent, of the total number of ambulatory morbidity visits accruing to child medical care practitioners in 1990.

Note: Columns 2, 3, 4, 5, 6, 8, and 10 represent the responses of the Child Medical Care Delphi Panel.

Table III.C.3 (Continued)

AMBULATORY CARE SERVICE REQUIREMENTS FOR PEDIATRIC MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS A/

ICDA & Diagnosis	1 Reference 1977 Rate per 100,000 B/	2 1977 Rate per 100,000	3 % Rate Change 1977 to 1990	4 % Requiring Health Care in 1990	5 % (0-16) Requiring Health Care that Should be Seen by Pediatrician/ GP/FP in 1990	6 1990 Norms of Care (Visits) for Pediatrician/GP/FP	7 Pre-Delegation Number of Visits	8 % of Visits that Should be Delegated to NP Health Care Provider in 1990 1/	9 % of Total Child Morbidity Visits in 1990 2/
Adverse Effect of Medicinal Agents									
965 Adverse effect of analgesics and antipyretics	20 C/								
--Other	667								
(960 Adverse effect of antibiotics)									
(961 Adverse effect of other anti-infectives)									
(962 Adverse effect of hormones and synthetic substitutes)									
(969 Adverse effect of local anesthetics)									
(977 Adverse effect of other and unspecied drugs)									
(979 Alcohol in combination with specified medicinal agents)									
		1,700	0	100	100	2.0 3/	2,093,006	5	0.8
Toxic Effect of Substances Chiefly Nonmedicinal as to Source									
981 Toxic effect of petroleum products									
982 Toxic effect of industrial solvents									
983 Toxic effect of corrosive aromatics, acids, and caustic alkalis	3								
989 Toxic effect of other substances chiefly nonmedical as to source	989								

A/ B/ C/ See footnotes at end of table.

1/ This column is the result of the Child Medical Care Delphi Panel. The sum of delegated visits for approximately 230 morbidity conditions amounted to 28.8 percent of all visits. GMENAC endorsed a 15 percent delegation rate for the aggregate of morbidity conditions accruing to the Child Medical Care specialty, based on the projected supply of nonphysician child health care providers. However, rates of delegation vary significantly by morbidity.

2/ Each morbidity condition or group of conditions requires ambulatory visits comprising at least 0.7 percent, and sums to 73.1 percent, of the total number of ambulatory morbidity visits accruing to child medical care practitioners in 1990.

3/ Modeling Panel, Child Care Panel 2.5 visits.

Note: Columns 2, 3, 4, 5, 6, 8, and 10 represent the responses of the Child Medical Care Delphi Panel.

Footnotes to Table III.C.3

(A/) Morbidity information as given in this table is based on the International Classification of Diseases, adapted for use in the United States (ICDA), which in turn is based on the eighth revision of the International Classification of Diseases (ICD). While the detailed list of three-digit ICDA categories consists of a list of 671 categories of diseases and morbidity conditions, the list as given in this table has been significantly reduced. Each of the following conditions was sufficient for a three-digit code to be included in the table as a separate "cell":

a) the code contained at least one-tenth of 1 percent of either the general practitioners' and family practitioners' or pediatricians' visit workload as determined by the National Ambulatory Medical Care Survey (NAMCS);

b) the Yale-Schonfeld study included norms of care for the code or for a morbidity component within the three-digit code; and

c) the USC-Mendenhall pediatrics study included a percentage referred to medical specialists for the code in its ambulatory encounters section.

Each of the following conditions was sufficient for a three-digit code to be included in the residual broad section headings of the code, listed as "other":

a) the code contained more than 0 but less than one-tenth of 1 percent of general practitioners' and family practitioners' or pediatricians' visit workload as determined by NAMCS; and

b) the USC Mendenhall pediatrics study contained data on norms of care for the code in its ambulatory encounters section.

ICDA codes at the three-digit level not meeting the conditions described above have not been included in this table and were not separately considered by the Panel. However, the Panel was free to add any conditions to the list that it thought would increase in importance in 1990, from a manpower standpoint.

(B/) Unless otherwise noted, the incidence-prevalence data contained in this table refer to U.S. population ages 0-16 and have been derived from special unpublished data tabulations of the National Center for Health Statistics' Health Interview Surveys of 1977 and previous years. Data on incidences of acute conditions at the three-digit ICDA level were taken from special tabulations of the 1977 Health Interview Survey covering the U.S. civilian non-institutional population and conform to data aggregates as published in the NCHS ries on Acute Conditions: Incidence and Associated Disability.

(Vital and Health Statistics, Series 10, DHEW Publication No. (PHS)78-1553). To these estimates have been added data on prevalences of chronic conditions at the three-digit ICDA level taken from special tabulations of previous Health Interview Surveys. Data on prevalences of chronic conditions conform to data aggregates as published in NCHS series on Prevalence of Chronic Skin and Musculoskeletal Conditions 1969: Prevalence of Chronic Conditions of the Genitourinary, Nervous, Endocrine, Metabolic, and Blood and Blood-Forming Systems and other Selected Chronic Conditions, 1973: Prevalence of Chronic Circulatory Conditions, 1972: and Prevalence of Selected Chronic Respiratory Conditions, 1970. (Vital and Health Statistics, Series 10, DHEW Publications). The prevalences of chronic conditions have been extrapolated to 1977 based on the changes in the U.S. population ages 0-16 between each respective survey year and 1977, using population estimates derived from the Bureau of the Census (Estimates of the Population of the United States by Age, Sex, and Race: 1970 to 1977. Current Population Reports, Series P-25, No. 721, April 1978.)

The incidence-prevalence estimates for the U.S. population ages 0-16 are presented in this column as rates per 100,000 population, ages 0-16. The population base used in the calculations was taken from the Bureau of Census' Current Population Reports cited previously.

(C/) This datum has been derived from special tabulations of the National Ambulatory Medical Care Survey (NAMCS). These survey tabulations cover the two-year period 1975-76, and include weighted numbers of "new" visits per ICDA condition. This number has been annualized and extrapolated to 1977. While used as a proxy for incidence-prevalence datum, it should be noted that this figure is not a true "incidence-prevalence" figure for the following reasons:

1. Unlike morbidity data in the Health Interview Survey, the NAMCS data may be thought of as morbidities that result in a visit to a physician.
2. The number of new visits from NAMCS theoretically undercounts the prevalence of chronic conditions the onset of which occurred prior to the NAMCS survey year.

It should also be noted that any figure taken from the special NAMCS tabulations with less than 100,000 visits has a relative standard error of at least 45 percent. Therefore, visits significantly less than 100,000 should be interpreted with extreme caution.

2. Pediatric Subspecialties

Overview--In November 1979, one consultant from each of the six pediatric subspecialties represented by subspecialty boards met to provide input to the generic model to be used to ultimately derive pediatric subspecialty manpower requirements. Pediatric allergy, pediatric cardiology, pediatric hematology-oncology, pediatric nephrology, pediatric endocrinology, and neonatal-perinatal medicine were represented.

Documentation of the Manpower Requirements Calculations--It was left up to each individual subspecialist to determine if both ambulatory and hospital data should be utilized to estimate requirements. If a subspecialist chose to examine hospital and ambulatory data to derive requirements, the ambulatory and hospital visits were added together and divided by the total patient care productivity. Pediatric allergy and endocrinology were seen as primarily ambulatory based and therefore the panelists for these subspecialties considered only ambulatory data. The other subspecialties examined both hospital and ambulatory data.

For neonatology, since all care is administered in a hospital setting and there are generally few patients older than one year, the subspecialist representing this area presented an alternate methodology to those offered by GMENAC to determine manpower requirements. (See neonatology section for details.)

In modeling the pediatric subspecialty requirements, most of the subspecialties were considered primarily as referral-based. The subspecialists were presented with reference material compiled from the Delphied responses of the Child Medical Care Delphi Panel as well as material from the multiple data sources presented in the briefing book. Using this material as a starting point for their deliberations, the subspecialists considered those ICDAs that the Child Medical Care Panel felt should be referred to them. While each subspecialist was responsible for responding to only those ICDAs referred to his subspecialty, the six subspecialists nonetheless interacted as a group, exchanging viewpoints on each ICDA and reaching agreement on most items. What follows is a general description of the responses of all the subspecialists focusing on the ambulatory care data.

Percent of Pediatricians' Patients to be Referred to Subspecialty--In several instances the pediatric subspecialists changed the referral estimates generated by the Child Medical Care Delphi Panel. The pediatric allergist in particular felt that a greater percentage of patients than that estimated from the Child Medical Care Panel should be referred from the pediatrician to his/her subspecialty.

Percent Requiring Health Care from Sources other than General Pediatricians--The consultants designated the percentage of visits that should be referred to their subspecialties from sources other than general pediatricians. In the vast majority of the cases, the subspecialists adopted the "triage" function of the general pediatrician; where they did not, they specified the other referring physician.

1990 Norms of Care--Utilizing as a reference the 1990 norms of care (visits) provided to them from the Child Medical Care Delphi Panel, subspecialists determined the norms of care applicable for their subspecialty for each ICDA, which depended on the role of the subspecialist (consultation or treatment), and the severity of the condition.

Delegation to Nonphysician Health Care Providers--With the exception of delegation by the pediatric allergist, delegation appeared to contribute insignificantly to the subspecialists' practice content.

Hospital Requirements--Data from the Hospital Discharge Survey (HDS) was given as reference to the questions concerning "True Need (for Hospitalization) Per 10,000 Population" and "Number of Hospital Visits that Should be Made by Pediatric Subspecialist, 1990". The subspecialists considered a total of 22 ICDAs for hospital care. Twelve of the ICDAs represented conditions unique to newborns.

True Need Per 10,000 Population--HDS data on discharges based on initial diagnosis were used as a baseline for determining "true need" for hospitalization, according to specific disease categories. The subspecialists' responses for the most part agreed with the reference data given.

Number of Visits that Should be Made by Pediatric Subspecialist, 1990--Data provided on length of stay per discharge was used as a reference in determining the number of visits which should be made by particular subspecialists for specific conditions in 1990. The number of visits by ICDA as estimated by the panelists, varied depending on the severity and complexity of the condition and whether the purpose was for consultation or care.

Percent Rate Change in Need to 1990--For all the morbidities, except for an increase in Malignant Neoplasms, Anemias, and Diseases of the Circulatory System, the subspecialists did not foresee any change in the rate of hospitalization between 1975 and 1990.

Percent of Adjusted Need that Should be Seen by Pediatric Subspecialist, 1990--As is the case for the number of visits that should be made for each ICDA, the response to this question varied depending on the role of the subspecialist--whether it be for treatment or consultation, as well as the severity and complexity of the condition.

Percent of Visits that Should be Delegated to Nonphysician Health Care Providers, 1990--For all hospital visits made by the pediatric subspecialist none were foreseen to be delegated.

Productivity--The productivity estimates reflect the productivity of the average professionally active pediatric subspecialist, whether being engaged in research, teaching, administration, or patient care. The number of weeks worked per year in 1990 was estimated as 46 for the neonatologist; all the other pediatric subspecialties foresaw working 47 weeks per year in 1990. The number of nonhospital visits a week ranged from none for the neonatologist, to 120 for the pediatric allergist. In contrast, the hospital visits per week varied from the neonatologist's estimate of 104 to the pediatric allergist's estimate of two. For the individual estimates of the subspecialists' productivity see Table III.C.4, "Need for Services and Health Care Productivity in 1990 for the Six Pediatric Subspecialties."

Impact of Adult Population on Pediatric Subspecialty Practice--The data bases given as reference as well as the panelists' responses focused on patients through the age of 16 years for the ambulatory care model and through the age of 14 years for the hospital care model. The panelists considered the percentage of their practice in 1990 that will be focused on patients above these ages. These estimates were used to increase the manpower requirements. Based on the ambulatory care model 15 percent of patients are expected to be older than 16 years of age. However, pediatric hematology-oncology predicted 7.5 percent of patients to be greater than 16 years of age. The percentage of patients greater than 14 years seeing a pediatric subspecialist in the hospital ranged from 10 to 15 percent. (See Table III.C.4.)

Percent of Time in Generalist Care--There was agreement among the subspecialists that very little of their time should be spent in generalist care. The range was from zero for the pediatric allergist to 10 percent for the pediatric endocrinologist. (See Table III.C.4.)

Table III.C.4

NEED FOR SERVICES AND HEALTH CARE PRODUCTIVITY IN 1990 FOR THE SIX PEDIATRIC SUBSPECIALTIES

Responses	Number of Weeks Worked per Year (1)	Number of Hours per Week in Dir. Patient Amb. Care (2)	Number of Hospital Hours per Week (3)	Number of Professional Hours per Week in Non-Patient Care Activities (4)	Total Number of Hours per Week Engaged in Professional Activity (5)	Number of Non-Hospital Visits per Week to Subspecialist (6)	Number of Hospital Visits per Week by Subspecialist (7)	Percent Added to Subspecialists' Practice to Account for: Ambulatory Care for Patients older than 16 years (8)	Percent Added to Subspecialists' Practice to Account for: Hospital Care for Patients older than 14 years (9)	Percent Added to Subspecialists' Practice to Account for: Time Which Should be Spent in Generalist Care (10)
Endocrin.	47	15	5	30	50	40	10	15	15	10
Allergy	47	44	4	12	60	120	2	15	20	0
Cardiology	47	10	33	21.2	64.2	25	45	15	10	1
Nephrology	47	12	30	18	60	12	35	15	15	1-2
Hem./Onc.	47	20	10	30	60	37.5	18.75	7.5	10	1
Neonat.	46	0	36	29	65	0	104	0	0	5

NEONATOLOGY

As reference material for the deliberations of the Child Medical Care Panel, the neonatologist presented two versions of a needs-based methodology. These methodologies were developed to more closely focus on the unique issues of this subspecialty as contrasted with the needs-based methodology appropriate to the other pediatric subspecialties.

Model A

A model developed by the American Academy of Pediatrics Committee on the Fetus and Newborn Section on Perinatal Pediatrics was presented. Staff adjusted this needs-based model to incorporate data from the 1990 census estimate.

On the assumption tnat 4 percent of neonates require Level III care and using a projected birthrate of 3,987,000 for 1989-1990, it is projected that 159,460 neonates will require this care in the target year. (See footnote 1/ to Table III.C.5 for a definition of Level III care.)

On the assumption that 7 percent of neonates require initial Level II care plus 75 percent of Level III patients who graduate will require Level II care, a total of 10 percent of live births require Level II care. (See footnote 2/ to Table III.C.5 for a definition of Level II care). Using the projected birthrate of 3,987,000 for 1989-1990 results in a projection that 398,650 neonates will require Level II care in 1990.

Using this methodology, 1990 requirements for neonatologists for Level II care are projected at 458 (assuming an average stay of 10 days and that 50 percent of Level II patients are managed by neonatologists at 12 patients daily per neonatologist); and 700 for Level III needs. Thus use of this model results in a combined requirement of 1,158 neonatologists. Table III.C.5 displays this model.

Model B

The second needs-based model presented by the neonatologist was based on a summary and recommendations of a report to Boston University Center for Health Planning by Dr. Paul R. Swyer, Chief of Perinatal Medicine at the Hospital for Sick Children in Toronto, Canada.

As calculated from this data, 30 neonates per thousand live births will require initial Level III care and 70 neonates per 1,000 live births will require initial Level II care. This converts to an estimated 450 neonates per million population who will require initial Level III care; of these, 375 will graduate to require Level II care; and an additional 1,050 will require initial Level II care. Assuming a projected 1990 U.S.

population of 243.5 million (as derived from the 1990 census estimate) and a mean of 672 neonates per neonatologist per year, this methodology results in an estimated requirement of 1,460 neonatologists. Table III.C.6 displays this model.

Derivation of Requirements

The manpower requirements for neonatology of 1,309 were derived from the mean estimate of the two models.

TABLE III.C.5

NUMERICAL ESTIMATES OF NEWBORNS REQUIRING SPECIAL CARE AND RESULTING NEONATOLOGISTS REQUIRED: MODEL A

	Level III 1/ (Intensive)	Level II 2/ (Intermediate & Continuing)			
Neonates requiring care/1,000 live births	40/1000	70/1000	+	30/1000	graduates of Level III
Total neonates/year (based on 3,987,000 births/yr. USA)3/	159,460	279,050	+	119,600	= 398,650
Average length stay (days)	10	10	+	10	
Patient days/year	1,594,600	2,790,500	+	1,196,000	= 3,986,500
Average daily patient census	4,368	7,644		3,358	11,002
Number of Level II Neonatologists required					458 4/
Number of Level III Neonatologists required	700 5/				
Total number required		1,158			

1/ Level III hospitals function as regional centers and provide all aspects of perinatal care, including intensive care and a broad range of continuously available subspecialty consultation.

2/ Level II hospitals have the capability for resuscitation, short-term assisted ventilation with bag and mask or endotracheal tube, intravenous therapy with infusion pumps, arterial blood gas monitoring, continuous cardiorespiratory monitoring with appropriate equipment, performance of exchange transfusion, and oxygen administration.

3/ Taken from an estimate from the 1990 Census.

4/ Assumes one-half of Level II patients managed by neonatologist, at 12 patients per neonatologist.

5/ Mean of numbers required assuming eight patients per neonatologist (546), six patients per neonatologist (728), and an estimate derived from the suggested need to utilize three neonatologists to staff each of 275 Level III units identified as currently serving the U.S. (825).

Table III.C.6

NUMERICAL ESTIMATES OF NEWBORNS REQUIRING SPECIAL CARE AND RESULTING NEONATOLOGISTS REQUIRED: MODEL B

	Level III	Level II
(1) Population base (millions)	1	1
(2) Number Live Births (16/1000 pop.)	15,000	15,000
(3) Incidence Low Births Weight/1000 live births	70	70
(4) Needing level care/1000 live births	30	70
(5) Patients/year	450	1,425
From Level II		(1,050)
From Level III		(375)
(6) Length of stay (days)	10	7
(7) Patient days/year	4,500	9,975
(8) Neonatologists/million pop. (equivalents)	3	3

The model results in an estimate of six neonatologists needed per 1,000,000 population. Using a projected U.S. population of 243.5 million results in 1,460 neonatologists needed.

PEDIATRIC ENDOCRINOLOGY

Based on the pediatric endocrinologist's perception of those morbidities that should be referred to the subspecialty, the panelists considered a total of 17 ICDAs. The ICDA morbidities of Precocious sexual development (42.8 percent), Congenital disorders of carbohydrate metabolism, Congenital disorders of lipid metabolism, gout, and other hyperalimentation (15.6 percent), and Short stature and delayed adolescence (14.3 percent) comprised 72.7 percent of the visits that determined manpower requirements for pediatric endocrinologists for 1990. Table III.C.8 displays the conditions that impacted significantly on the requirements.

The number of nonhospital visits per endocrinologist per year in 1990 (1,880) was based on a capacity of 40 nonhospital visits per week and working 47 weeks per year in 1990. The requirements were increased to account for the pediatric endocrinologist's estimate of 15 percent of patients 17 years of age and older in 1990, as well as the panelists' estimate of 10 percent of time which should be spent in generalist care. See Table III.C.7 for summarization of the requirements. Note that these requirements do not account for the impact of the internal medicine subspecialty of endocrinology on child care. This impact was later considered by the Modeling Panel and can be found in Table III.C.19 on p. 110.

Table III.C.7

SUMMARY OUTPUT OF THE CHILD MEDICAL CARE SUBSPECIALTY DELPHI PROCESS
PEDIATRIC ENDOCRINOLOGY

	Ambulatory Model	
	Before Delegation	After Delegation
1) Number of Ambulatory Child Morbidity Visits 1/	1,547,831	1,521,325
2) Number of Nonhospital Visits per Endocrinologist per Year	1,880	1,880
3) Number of Pediatric Endocrinologists Required 2/	914	899

1/ Adjusted to account for 15 percent of the endocrinology ambulatory practice in 1990 for patients older than 16 years of age.

2/ Adjusted to account for 10 percent of the time which should be spent in generalist care.

NOTE: These requirements do not take into account the impact of the internal medicine subspecialty of endocrinology on child care. This impact was later considered by the Modeling Panel and can be found in Table III.C.19 on p. 110.

Table III.C.8

AMBULATORY MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON PEDIATRIC ENDOCRINOLOGY MANPOWER REQUIREMENTS

ICDA & Diagnosis (1)	1990 Adjusted Rate per 100,000 Ages 0-16 as Perceived by Pediatric Endocrinologist (2)	% of Pediatricians' Patients Ages 0-16 to be Referred to Ped. Endocrinologist as Perceived by Ped. Endocrinologist, 1990 (3)	% Requiring Health Care that Should be Seen by Endocrinologist from Sources, other than General Pediatricians, 1990 (4)	1990 Ambulatory Norms of Care (Visits) for Ped. Endocrinology as Perceived by Ped. Endocrinologist (5)	% of Visits to Endocrinologist that Should be Delegated to Non-Physician Health Care Providers as Perceived by Ped. Endocrinologist, 1990 (6)	% Share of Ambulatory Visits Accruing to Pediatric Endocrinologist (7)
NOS 2 Precocious sexual development	900	50	0	2.0	0	42.8
Other (270-279) (271 Congenital disorders of carbohydrate metabolism) (272 Congenital disorders of lipid metabolism) (274 Gout) (278 Other hyperalimentation)	109	100	0	3.0	0	15.6
NOS 1 Short stature and delayed adolescence	3,000	10	0	1.0	0	14.3

PEDIATRIC HEMATOLOGY/ONCOLOGY

The hematologist/oncologist utilized slightly over 20 ICDAs in both the ambulatory and hospital settings based on the perception of those morbidities that should be referred to the subspecialty to determine manpower requirements for pediatric hematology/oncology for 1990. The ICDA morbidities of Other Deficiency Anemias, Acquired Hemolytic Anemias, Aplastic Anemias, Other and Unspecified Anemias, Coagulation Defects, and Purpura and Other Hemorrhagic Conditions as seen in the ambulatory setting comprised 51.4 percent of all ambulatory and hospital visits. Malignant Neoplasms seen in the hospital made up 17.9 percent of all hospital and ambulatory visits. Approximately 64 percent of the pediatric hematologist/oncologist's visits were expected to be seen in the ambulatory setting in 1990.

The number of nonhospital visits of 1,763 per hematologist/oncologist per year was the result of working 47 weeks per year and seeing 37.5 visits per week in 1990. The ambulatory visits were increased by 7.5 percent for patients in the ambulatory setting in 1990 that were 17 years of age and older.

The hematologist/oncologist estimated 881 hospital visits per year dependent on working 47 weeks and 18.75 hospital visits per week. The number of hospital visits was increased to account for 10 percent of patients 15 years of age and older in 1990. The number of hematologist-oncologists in 1990 was increased to account for 1.0 percent of time which should be spent in generalist care.

Table III.C.9 summarizes the manpower requirements, and Table III.C.10 displays conditions which accounted for a major part of the workload. Note that Table III.C.9 does not account for the impact of the internal medicine subspecialty of hematology/oncology on child care. This impact was later considered by the Modeling Panel and can be found in Table III.C.19 on p. 110.

Table III.C.9

SUMMARY OUTPUT OF THE CHILD MEDICAL CARE SUBSPECIALTY DELPHI PROCESS PEDIATRIC HEMATOLOGY/ONCOLOGY

	Ambulatory Model		Amublatory & Hospital Model	
	Before Delegation	After Delegation	Before Delegation	After Delegation
1) Number of Ambulatory Child Morbidity Visits 1/	3,444,718	3,240,397	3,444,718	3,240,397
2) Number of Hospital Child Morbidity Visits 2/	—	—	1,809,662	1,809,662
3) Number of Nonhospital Visits per Hematologist/ Oncologist per Year	1,763	1,763	1,763	1,763
4) Number of Hospital Visits per Hematologist/Oncologist per Year	—	—	881	881
5) Number of Pediatric Hematologists/Oncologists Required 3/	1,974	1,856	2,007	1,929

1/ Adjusted to account for 7.5 percent of the hematology/oncology ambulatory practice in 1990 for patients older than 16 years of age.

2/ Adjusted to account for 10 percent of the hematology/oncology hospital practice in 1990 for patients older than 14 years of age.

3/ Adjusted to account for 1.0 percent of the time which should be spent in generalist care.

Note: These requirements do not take account of the impact of the internal medicine subspecialty of hematology/oncology on child care. This impact was later considered by the Modeling Panel and can be found in Table III.C.19 on p. 110.

Table III.C.10

MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON PEDIATRIC HEMATOLOGY/ONCOLOGY MANPOWER REQUIREMENTS

AMBULATORY MORBIDITY CONDITIONS AND SERVICE NORMS FOR PATIENTS AGES 0-16 IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS

ICDA & Diagnosis (1)	1990 Adjusted Rate per 100,000 Ages 0-16 as Perceived by Ped. Hem./Onc. (2)	% of Pediatricians' Patients Ages 0-16 to be Referred to Ped. Hem./Onc. as Perceived by Ped. Hem./Onc., 1990 (3)	% Requiring Health Care that Should be Seen by Ped. Hem./Onc. from Sources, other than General Pediatricians, 1990 (4)	1990 Ambulatory Norms of Care (Visits) for Ped. Hem./Onc. as Perceived by Ped. Hem./Onc. (5)	% of Visits to Ped. Hem/Onc. that Should be Delegated to Non-Physician Health Care Providers as Perceived by Ped. Hem/Onc., 1990 (6)	% Share Total Visits (Hosp. & Amb.) Accruing to Pediatric Hem./Onc. (7)
Other (280-289) (281 Other deficiency anemias) (283 Acquired hemolytic anemias) (284 Aplastic anemia) (285 Other and unspecified anemias) (286 Coagulation defects) (287 Purpura and other hemorrhagic conditions)	1,074	90	0	4.0	0	51.4

HOSPITAL DISCHARGES AND SERVICE NORMS FOR PATIENTS AGES 0-14 FOR CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS*

Column	1	2	3	4	5	6	7	8
ICDA Number	Diagnosis	Number of Discharges per 10,000 Population, 1975	True Need per 10,000 Population, 1978	Percent Rate Change in True Need 1978 to 1990	Percent of Adjusted Need Should be Seen by Pediatric Hem./Onc., 1990	Number of Hospital Visits Should be Made by Pediatric Hem./Onc., 1990	Percent of Visits Should be Delegated to Nonphysician Providers 1990	% Share of Total Visits (Hosp. & Amb.) Accruing to Pediatric Hem./Onc.
140-209	Malignant Neoplasms	4.7	5.7	+25	100	21.2	0	17.9

* Column 2 is the HDS reference for column 3.
Columns 3, 4, 5, 6, and 7 represent the perceptions of the Pediatric Hematologist/Oncologist.

PEDIATRIC NEPHROLOGY

The pediatric nephrologist considered approximately 20 ICDAs based on the perception of those morbidities referred to the subspecialty seen in the ambulatory and hospital settings. Approximately 90 percent of all visits were expected to be seen in the hospital. Diseases of the Genitourinary System seen in the hospital setting were expected to comprise 64.1 percent of all hospital and ambulatory visits. Table III.C.12 displays in detail the conditions which were significant manpower determinants for pediatric nephrology for 1990.

The estimate of 1,645 hospital visits per pediatric nephrologist per year was based on working 47 weeks a year and making 35 hospital visits per week in 1990. The hospital visits were increased to account for 15 percent of patients 15 years of age and older in 1990. The estimate of 564 nonhospital visits per pediatric nephrologist per year was attributed to 12 nonhospital visits per week working 47 weeks. The manpower requirements for 1990 were increased by 1.5 percent to account for the estimate of time which should be spent in generalist care. Table III.C.11 summarizes the manpower requirements. Note that these requirements do not account for the impact of the internal medicine subspecialty of nephrology on child care. This impact was later considered by the Modeling Panel of GMENAC and can be found in Table 111.C.19 on p. 110.

Table III.C.11

SUMMARY OUTPUT OF THE CHILD MEDICAL CARE SUBSPECIALTY DELPHI PROCESS
PEDIATRIC NEPHROLOGY

	Ambulatory Model		Ambulatory & Hospital Model	
	Before Delegation	After Delegation	Before Delegation	After Delegation
1) Number of Ambulatory Child Morbidity Visits 1/	188,325	161,371	188,325	161,371
2) Number of Hospital Child Morbidity Visits 2/	--	--	641,720	641,720
3) Number of Nonhospital Visits per Nephrologist per Year	564	564	564	564
4) Number of Hospital Visits Per Nephrologist per Year	--	--	1,645	1,645
5) Number of Pediatric Nephrologists Required 3/	339	290	382	369

1/ Adjusted to account for 15 percent of the nephrology ambulatory practice in 1990 for patients older than 16 years of age.

2/ Adjusted to account for 15 percent of the nephrology hospital practice in 1990 for patients older than 14 years of age.

3/ Adjusted to account for 1.5 percent of the time which should be spent in generalist care.

Note: These requirements do not account for the impact of the internal medicine subspecialty of nephrology on child care. This impact was later considered by the Modeling Panel of GMENAC and can be found in Table 111.C.19 on p. 110.

Table III.C.12

MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON PEDIATRIC NEPHROLOGY MANPOWER REQUIREMENTS

AMBULATORY MORBIDITY CONDITIONS AND SERVICE NORMS FOR PATIENTS AGES 0-16 IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS

ICDA & Diagnosis (1)	1990 Adjusted Rate per 100,000 Ages 0-16 as Perceived by Pediatric Nephrologist (2)	% of Pediatricians' Patients Ages 0-16 to be Referred to Ped. Nephrologist as Perceived by Ped. Nephrologist, 1990 (3)	% Requiring Health Care that Should be Seen by Ped. Nephrologist from Sources, other than General Pediatricians, 1990 (4)	1990 Ambulatory Norms of Care (Visits) for Ped. Nephrology as Perceived by Ped. Nephrologist (5)	% of Visits to Ped. Nephrologist that Should be Delegated to Non-Physician Health Care Providers as Perceived by Ped. Nephrologist, 1990 (6)	% Share of Total Visits (Hospital & Ambulatory) Accruing to Pediatric Nephrologist (7)
598 Stricture of urethra 599 Other diseases of urinary tract	124	100	0	1.0	25	8.3

HOSPITAL DISCHARGES AND SERVICE NORMS FOR PATIENTS AGES 0-14 FOR CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS*

Column	1		2	3	4	5	6	7	8
ICDA Number	Diagnosis		Number of Discharges per 10,000 Population, 1975	True Need per 10,000 Population, 1978	Percent Rate Change in True Need 1978 to 1990	Percent of Adjusted Need Should be Seen by Pediatric Nephrologist, 1990	Number of Visits Should be Made by Pediatric Nephrologist, 1990	Percent of Visits Should be Delegated to Nonphysician Providers, 1990	% Share of Total Visits (Hospital & Ambulatory) Accruing to Pediatric Nephrologist
580-629	Diseases of the Genito-urinary System	221	41.2	41.2	0	100	3.8	0	64.1

* Column 2 is the HDS reference for Column 3.
Columns 3, 4, 5, 6, and 7 represent the perceptions of the Pediatric Nephrologist.

PEDIATRIC CARDIOLOGY

The pediatric cardiologist responded to approximately 18 individual and grouped ICDAs in the ambulatory and hospital setting based on the panelists' perception of those morbidities that should be referred to the subspecialty. Approximately 60 percent of all visits were expected to be made in the hospital in 1990. The ICDAs Congenital Anomalies of Heart (23.5 percent) and Diseases of the Circulatory System (20.4 percent) when seen in the hospital comprised 43.9 percent of all visits (hospital and ambulatory). Congenital Anomalies of Heart when seen in the ambulatory setting made up 22.4 percent of ambulatory visits. Table III.C.14 displays the conditions which were significant manpower determinants for pediatrics cardiology for 1990.

The estimate of a 2,215 hospital visit capacity per year results from working 47 weeks per year and seeing 45 hospital visits per week in 1990. The number of hospital visits was increased to account for 10 percent of the hospital practice in 1990 which will consist of patients 15 years of age or older.

The estimate of 1,175 nonhospital visits per pediatric cardiologist is expected in 1990 based on 25 visits per week and working 47 weeks per year. The number of nonhospital visits was increased by 7 percent for the ambulatory pediatric cardiology practice for patients 17 years of age and older. The total number of pediatric cardiologists was adjusted to account for 1 percent of time to be spent in generalist care in 1990. The requirements are summarized in Table III.C.13. Note that Table III.C.13 does not account for the impact of the internal medicine subspecialty of cardiology on the child care requirements. This impact was later considered by the Modeling Panel and can be found in Table III.C.19 on p. 110.

Table III.C.13

SUMMARY OUTPUT OF THE CHILD MEDICAL CARE SUBSPECIALTY DELPHI PROCESS
PEDIATRIC CARDIOLOGY

	Ambulatory Model		Ambulatory & Hospital Model	
	Before Delegation	After Delegation	Before Delegation	After Delegation
1) Number of Ambulatory Child Morbidity Visits 1/	1,510,274	1,510,274	1,510,274	1,510,274
2) Number of Hospital Child Morbidity Visits 2/	—	—	2,291,943	2,291,943
3) Number of Nonhospital Visits per Cardiologist per Year	1,175	1,175	1,175	1,175
4) Number of Hospital Visits per Cardiologist per Year	—	—	2,215	2,215
5) Number of Pediatric Cardiologists Required 3/	1,298	1,298	1,133	1,133

1/ Adjusted to account for 7 percent of the cardiology ambulatory practice in 1990 for patients older than 16 years of age.

2/ Adjusted to account for 10 percent of the cardiology hospital practice in 1990 for patients older than 14 years of age.

3/ Adjusted to account for 1.0 percent of the time which should be spent in generalist care.

Note: These requirements do not account for the impact of the internal medicine subspecialty of cardiology on child care. This impact was later considered by the Modeling Panel of GMENAC and can be found in Table III.C.19 on p. 110.

Table III.C.14

MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON PEDIATRIC CARDIOLOGY MANPOWER REQUIREMENTS

AMBULATORY MORBIDITY CONDITIONS AND SERVICE NORMS FOR PATIENTS AGES 0-16 IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS

ICDA & Diagnosis (1)		1990 Adjusted Rate per 100,000 Ages 0-16 as Perceived by Pediatric Cardiologist (2)	% of Pediatricians' Patients Ages 0-16 to be Referred to Ped. Cardiologist as Perceived by Ped. Cardiologist, 1990 (3)	% Requiring Health Care that Should be Seen by Ped. Cardiologist from Sources, other than General Pediatricians, 1990 (4)	1990 Ambulatory Norms of Care (Visits) for Ped. Cardiology as Perceived by Ped. Cardiologist (5)	% of Visits to Ped. Cardiologist that Should be Delegated to Non-Physician Health Care Providers as Perceived by Ped. Cardiologist, 1990 (6)	% Share of Total Visits (Hospital and Ambulatory) Accruing to Pediatric Cardiologist (7)
746	Congenital anomalies of heart	642	100	0	2.0*	0	22.4

HOSPITAL DISCHARGES AND SERVICE NORMS FOR PATIENTS AGES 0-14 FOR CONDITIONS IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS 1/

Column	1	2	3	4	5	6	7	8
ICDA Number	Diagnosis	Number of Discharges per 10,000 Population, 1975	True Need per 10,000 Population, 1978	Percent Rate Change in True Need 1978 to 1990	Percent of Adjusted Need Should be Seen by Pediatric Cardiologist, 1990	Number of Hospital Visits Should be Made by Pediatric Cardiologist, 1990	Percent of Visits Should be Delegated to Nonphysician Providers 1990	% Share of Total Visits (Hospital & Ambulatory) Accruing to Pediatric Cardiologist
740-759	Congenital Anomalies	31.3	31.3	0	40	12	0	23.5
390-458	Diseases of the Circulatory System	6.8	10.0	+30	100	10	0	20.4

* Annualized

1/ Column 2 is the HDS reference for Column 3.
Columns 3, 4, 5, 6, and 7 represent the perceptions of the Pediatric Cardiologist.

PEDIATRIC ALLERGY

The pediatric allergist responded to a total of 13 ICDAs seen in the ambulatory setting based on the panelists' perception of those morbidities which should be referred to the subspecialty. The ICDAs of Hay Fever (32.7 percent), Asthma (27.2 percent), Bronchitis, Unqualified and Chronic Bronchitis (20.6 percent), and Chronic Sinusitis (15.6 percent) comprise 96.1 percent of the projected visits for 1990. Hay Fever is generally a non-life-threatening disease which has a significant impact on the number of pediatric allergists required. See Table III.C.16 for those conditions that impacted significantly on the requirements for pediatric allergy for 1990.

The pediatric allergist estimated higher referral rates from the generalist to the subspecialty than that developed by the Child Medical Care Consultant Panel due to his perception of increasing technology and more complicated therapeutic procedures that will become available in the future. For example, the allergist pointed out that imminent changes in formulation and availability of biologicals will add new dimensions to the diagnosis, treatment and even the "cure" of asthma and hay fever through such mechanisms as alteration of IgE, and other antibody production mechanisms including alteration of T-cell function.

The nonhospital visit capacity of allergists per year of 5,640 in 1990 was based on working 47 weeks per year and 120 nonhospital visits per week. The pediatric allergist felt that he/she should be delegating approximately 25 percent of visits in 1990. The pediatric allergist estimated that in 1990 10 percent of pediatric allergists will be engaged in nonpatient care activities compared to 10.6 percent in 1977 based on AMA data. In addition, 15 percent of the pediatric allergist's practice was expected to be involved with patients 17 years of age and older. See Table III.C.15 for summary requirements. These requirements do not take into account the Modeling Panel's revisions (found in Table III.C.17), nor the impact of the internal medicine subspecialty of allergy on child care. This impact was later considered by the Modeling Panel and can be found in Table III.C.19 on p. 110.

Table III.C.15

SUMMARY OUTPUT OF THE CHILD MEDICAL CARE SUBSPECIALTY DELPHI PROCESS
PEDIATRIC ALLERGY

AMBULATORY MODEL

	Before Delegation	After Delegation
1) Number of Ambulatory Child Morbidity Visits 1/	22,499,770	10,582,676
2) Number of Nonhospital Visits per Allergist per Year	5,640	5,640
3) Number of Pediatric Allergists Required	3,989	2,940
4) Number of Total Pediatric Allergists Required 2/	4,388	3,234

1/ Adjusted to account for 15 percent of the allergy ambulatory practice in 1990 for patients older than 16 years of age.

2/ Adjusted for 10 percent of pediatric allergists who should be engaged in nonpatient care activities.

NOTE: These requirements do not take into account the Modeling Panel revisions (found in Table III.C.17), nor the impact of the internal medicine subspecialty of allergy on child care. This impact was later considered by the Modeling Panel and can be found in Table III.C.19 on p. 110.

Table III.C.16

MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON PEDIATRIC ALLERGY MANPOWER REQUIREMENTS

AMBULATORY MORBIDITY CONDITIONS AND SERVICE NORMS FOR PATIENTS AGES 0-16 IMPACTING SIGNIFICANTLY ON MANPOWER REQUIREMENTS

ICDA & Diagnosis (1)	1990 Adjusted Rate per 100,000 Ages 0-16 as Perceived by Pediatric Allergist (2)	% of Pediatricians' Patients Ages 0 - 16 to be Referred to Ped. Allergy as Perceived by Ped. Allergist, 1990 (3)	% Requiring Health Care that Should be Seen by Ped. Allergy, from Sources other than General Pediatricians, 1990 (4)	1990 Ambulatory Norms of Care (Visits) for Ped. Allergy as Perceived by Pediatric Allergist (5)	% of Visits to Ped. Allergist that Should be Delegated to Non-Physician Health Care Providers as Perceived by Ped. Allergist, 1990 (6)	% Share of Ambulatory Visits Accruing to Pediatric Allergist (7)
507 Hay fever	5,000	60	10 (From OTO) 1/	3.0	40	32.7
493 Asthma	3,157	80	5 (From PD) 2/	3.0	20	27.2
503 Chronic sinusitis	2,923	80	10 (From OTO)	2.0	30	15.6
490 Bronchitis, unqualified and 491 Chronic bronchitis	4,424	50 PDA	5 (From PD)	2.0	0	20.6

1/ Otorhinolaryngologist
2/ Pulmonary Disease Specialist

Modeling Panel Review of Pediatric Subspecialty Estimates

Pediatric Allergy--In March, 1980 the Modeling Panel reviewed the Pediatric Subspecialty Delphi Panel results. It recommended the following changes to the pediatric allergy results which reduced the number of aggregate visits accruing the subspecialty:

1. For ICDA 490-1, Bronchitis, reduce the percentage referred to the pediatric allergist from the general pediatrician from 55 to 20 percent.
2. For ICDA 493, Asthma, reduce the percentage referred to the pediatric allergist from the general pediatrician from 85 to 30 percent.
3. For ICDA 503, Chronic Sinusitis, reduce the percentage referred to the pediatric allergist from the general pediatrician from 90 to 15 percent.
4. For ICDA 507, Hay Fever, reduce the percentage referred to the pediatric allergist from the general pediatrician from 70 to 20 percent.

The Modeling Panel recommended a 21 percent reduction in the visits accruing to the pediatric allergist based on simultaneity data derived from NAMCS that indicated that the average pediatric allergist currently handles 1.284 conditions per visit. The GMENAC plenary session participants felt that the 1.284 conditions per visit included both generalist and allergist conditions. Therefore, GMENAC reduced the factor to 1.200 to account for seeing only allergy related conditions.

Tables III.C.17 and III.C.18 summarize the revisions that the Modeling Panel made in the manpower requirements calculation for pediatric allergy, excluding the impact of the internal medicine subspecialty of allergy on pediatric allergy requirements which is found on Table III.C.19 on p. 110.

The rationale for the preceding changes was that the subspecialist's estimate of 3,234 pediatric allergists is not achievable until well after 1990. Between now and 1990, there is a need to upgrade the skills of some of the currently practicing pediatric allergists, and to assure that current and future training programs in allergy and immunology incorporate the latest research and technology in the curricula. As a reasonable and achievable target the Modeling Panel recommended 800-1,000 pediatric allergists for 1990.

Pediatric Cardiology--The Modeling Panel recommended a reduction in the number of visits accruing to the subspecialty of pediatric cardiology by applying a simultaneity factor of 1.600 conditions per visit as derived from NAMCS to the ambulatory portion of the pediatric cardiological requirements. The GMENAC plenary session participants felt that since the pediatric cardiologist will be handling primarily cardiological conditions, he/she will not be seeing more than one cardiological condition per visit. Therefore, no reduction in the number of visits accruing to the pediatric cardiologist was recommended.

Impact of Internal Medicine Subspecialties on Pediatric Subspecialty Requirements--The Modeling Panel estimated the percentage of each internal medicine adult subspecialty that should be focused on patients younger than 17 years of age. These percentages resulted in reducing the manpower requirements for the pediatric subspecialties. The final requirements for the pediatrics subspecialties detailing this impact can be found in Table III.C.19.

1990 Requirements--The GMENAC Committee adopted the requirements estimates made by the Modeling Panel that are listed in column 3 of Table III.C.19. Note that column 2 contains the manpower requirements of the pediatric subspecialties based on the Modeling Panel revisions to account for the impact of the appropriate internal medicine subspecialties on child care.

Table III.C.17

SUMMARY OUTPUT OF MODELING PANEL ADJUSTMENTS FOR MANPOWER REQUIREMENTS FOR PEDIATRIC ALLERGY

	Ambulatory Model	
	Before Delegation	After Delegation
1) Number of Ambulatory Child Morbidity Visits 1/	8,511,737	6,215,541
2) Number of Ambulatory Child Morbidity Visits 2/	7,093,114	5,179,618
3) Number of Nonhospital Visits per Allergist per Year	5,640	5,640
4) Number of Pediatric Allergists Required	1,258	918
5) Number of Total Pediatric Allergists Required 3/	1,398	1,020

1/ Adjusted to account for 15 percent of the allergy ambulatory practice in 1990 for patients older than 16 years of age.

2/ Adjusted to account for a simultaneity factor of 1.200 conditions per visit.

3/ Adjusted for 10 percent of pediatric allergists who should be engaged in nonpatient care activities.

NOTE: These requirements do not take into account the impact of the internal medicine subspecialty of allergy (found in Table III.C.19).

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Table III.C.18

AMBULATORY MORBIDITY CONDITIONS IMPACTING SIGNIFICANTLY ON PEDIATRIC ALLERGY MANPOWER REQUIREMENTS AS A RESULT OF MODELING PANEL ADJUSTMENTS

ICDA & Diagnosis (1)	1990 Adjusted Rate per 100,000 Ages 0-16 as Perceived by Pediatric Allergist (2)	% of Pediatricians' Patients Ages 0-16 to be Referred to Ped. Allergy as Perceived by Ped. Allergist, 1990 (3)	% Requiring Health Care that Should be Seen by Pediatric Allergist from Sources, other than General Pediatricians, 1990 (4)	1990 Ambulatory Norms of Care (Visits) for Ped. Allergy as Perceived by Ped. Allergist (5)	% of Visits to Ped. Allergist that Should be Delegated to Non-Physician Health Care Providers as Perceived by Ped. Allergist, 1990 (6)	% Share of Ambulatory Visits Accruing to Pediatric Allergist (7)
493 Asthma	3,157	80 1/	5 (From PD) 1/	3.0	20	26.5
507 Hay fever	5,000	60 2/	10 (From OTO) 2/	3.0	40	21.0
490 Bronchitis, unqualified and 491 Chronic bronchitis	4,424	50 3/	5 (From PD) 3/	2.0	0	15.5

1/ For ICDA 493, the Modeling Panel recommended a 30 percent total referral to the pediatric allergist.

2/ For ICDA 507, the Modeling Panel recommended a 20 percent total referral to the pediatric allergist.

3/ For ICDAs 490-1, the Modeling Panel recommended a 20 percent total referral to the pediatric allergist.

Table III.C.19

1990 REQUIREMENTS: PEDIATRIC SUBSPECIALTIES

Specialty	(1) Initial Modeling Panel Estimates	(2) After Accounting for Impact of Internal Medicine Subspecialties on Child Care	(3) Final Modeling Panel Estimates 2/
Ped. Allergists	1,020	924	800-1,000
Ped. Cardiologists	1,133	1,092	1,100-1,200
Ped. Endocrinologists	899	791	700-850
Ped. Hematologist/ Oncologists	1,929	1,617	1,600-1,700
Ped. Nephrologists	369	1/	300-350
Neonatologists	1,309	N.A.	1,250-1,350

1/ While the impact of the nephrologist on child care reduces the requirements for pediatric nephrologists to 242, the Modeling Panel recommended that only a portion of this impact be utilized in determining manpower requirements for the pediatric nephrologist.

2/ GMENAC adopted the requirements estimates made by the Modeling Panel.

D. GENERAL SURGERY

1. Overview

Delphi Panels for the eight surgical specialties were conducted for GMENAC by the Battelle Human Affairs Research Centers under contract to the Office of Graduate Medical Education. For a detailed description of the general surgery and other surgical Delphi Panels, see Wills and Garrison, 1980.

For GMENAC's purposes, the general surgery workload was defined to include colon-rectal surgery. This specialty area was not modeled separately because of its relatively small size.

Several general themes emerged from the General Surgery Panel's deliberations. The first of these is that the Panel expected general surgeons to practice more within the specialty in 1990. This would presumably mean a typical workload that included relatively more surgery and surgery-related care, and relatively less nonsurgical or "generalist" care. Furthermore, it would also signify a shift in the composition of conditions treated by general surgeons. For example the General Surgery Delphi Panel assumed that by 1990 there would be many more orthopedic surgeons, and that they would be more widely distributed. Hence, the role of general surgeons in treating orthopedic conditions was projected to decline.

The Panel also felt, however, that requirements for general surgeons would increase as a result of several factors. By 1990, the Panel felt, general practitioners would no longer be doing abdominal surgery. Also, it was noted that general surgery residency programs are training physicians to operate for esophageal cancer, and this would become part of the workload in 1990. On the other hand, gynecological training is being reduced in general surgery residency programs. Trauma care was expected to remain a major concern of general surgeons, and access surgery for renal dialysis was identified as an important determinant of the surgical manpower requirement.

2. Documentation of Manpower Requirements Calculation

Manpower requirements in general surgery were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of general surgeons. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each service category. The sum of FTEs across service categories was then inflated to account for requirements for general surgeons to perform nonpatient care tasks such as teaching, research, and administration.

Each step in the calculation is documented.

Service Requirements--The General Surgery Panel estimated service requirements in three categories, as follows:

-- Office visits to nonsurgical, nonhospitalized patients;

-- Office and inpatient visits to nonsurgical, hospitalized patients; and

-- Surgical care, including both performance of the procedure and the associated inpatient and office visits.

Nonsurgical, Nonhospitalized Patients--Service requirements for nonsurgical, nonhospitalized patients were estimated by the Panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the incidence or prevalence rate (per 100,000 population) of the disease or condition was multiplied by the proportion of individuals with that condition who should be seen by a physician, and that by the proportion of *those* individuals who should be seen by a general surgeon. The proportion who should see a physician are those who should see a physician *in a given year*. Thus, for example, even if all individuals with a certain chronic condition should at some time or another see a physician, if once diagnosed they need to see a physician only every other year then the proportion who should see a physician in 1990 is 50 percent. This group was then divided into two subgroups: (1) those who should be treated surgically, and (2) those who should be treated nonsurgically. The nonsurgical group was further subdivided into those who would enter the hospital for medical treatment, versus those who would be treated only in the office. In this first service requirements category, the Panel estimated the service requirements for this last group of patients--those who were nonsurgical and would not enter the hospital for medical treatment. For each patient with a given condition, a norm of care, measured as the average required office visits per episode of the condition per year, was established. Multiplying this norm by the number of individuals falling into the nonsurgical, non- hospitalized group yields the total service requirement for visits per 100,000 population for this condition. The total requirements were calculated by summing these office visits rates across all conditions and multiplying by 2,435, since the 1990 Series II Census projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by general surgeons. This was based on the Panel's estimate of the relative size of a residual category which included those other conditions not on the list but yet part of the over- all workload. The service requirements for nonsurgical, nonhospitalized patients are summarized in Table III.D.1.

Nonsurgical, Hospitalized Patients--In this category, although the Panel estimated the service requirements for those nonsurgical patients who would be hospitalized, however, the requirements are in terms of both inpatient visit *and* office visits. Again, norms of care were established which reflect the average number of visits which should be received annually per episode of a given condition in 1990. For inpatient visits the panel explicitly delegated a certain number of visits for each condition to nonphysician health care providers. Total service requirements in this category were calculated by summing visit rates across all conditions. Again, an adjustment was made to account for conditions not explicitly considered by the Panel but yet part of the general surgery overall workload. The service requirements for nonsurgical, hospitalized patients are summarized in Table III.D.2.

Table III.D.1.

SERVICE REQUIREMENTS FOR GENERAL SURGEONS FOR NONSURGICAL, NONHOSPITALIZED PATIENTS

$S_1 = \sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot D_c \cdot N1_c) .2435/f_1 = 12{,}249{,}916$ office visits:

where

S_1 = service requirements;

I_c = morbidity rate (per 100,000) of condition c;

A_c = proportion of episodes of c which should be seen by a physician;

B_c = proportion of episodes seen by a physician which should be seen by a general surgeon;

C_c = proportion of episodes which are nonsurgical;

D_c = proportion of nonsurgical episodes which are not hospitalized;

$N1_c$ = number of annual office visits per episode of c for these patients;

f_1 = proportion of total visit workload represented by the explicitly considered conditions = .85; and

$\sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot D_c \cdot N1_c) = 4{,}275.9$ visits per 100,000

Table III.D.2.

SERVICE REQUIREMENTS FOR GENERAL SURGEONS FOR NONSURGICAL, HOSPITALIZED PATIENTS

A. Inpatient Component

$S_{2A} = \sum_c (X_c \cdot (N2_c - E_c)) \cdot 2435/f_1 = 6{,}733{,}205$ inpatient visits:

where

S_{2A} = service requirements;

X_c = ${}_c(I_c \cdot A_c \cdot B_c \cdot C_c \cdot (1-D_c))$, see Table II-1;

$N2_c$ = annual inpatient visits per episode of c for these patients;

E_c = number of inpatient visit for c delegable to a nonphysician provider; and

$\sum_c (X_c \cdot (N_{2c} - E_c)) = 2350.4$ visits per 100,000.

B. Office Component

$S_{2B} = \sum_c (X_c \cdot N3_c) \cdot 2435/f_1 = 2{,}132{,}487$ office visits.

where

S_{2B} = service requirements;

$N3_c$ = annual office visits per episode of c for these patients; and

$\sum_c (X_c \cdot N3_c) = 744.4$ visits per 100,000.

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the following parameters: the 1990 rate (per 100,000 population) at which the surgical procedure should be performed, the proportion of these cases which should be done by a general surgeon and the average time per procedure. Time was measured in terms of a quasi - "California Relative Value" (CRV) index, which reflects the relative time and effort spent by a physician performing a specific operative procedure. One "unit" was taken as one-sixth of an hour. The time included not merely skin-to-skin time in the operating room, but also time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement for a given procedure per 100,000 population is simply the product of three factors: the procedure rate, the proportion to be done by the general surgeons, and the time in hours required (the CRV divided by 6). However, two further adjustments were made. First, for each procedure the Panel estimated the proportion of times it was performed as a secondary rather than primary procedure. Since giving secondary procedures the same time requirements as primary procedures would lead to an overestimate of service requirements, the Panel adopted the convention of giving them a time equal to 50 percent of their time as a primary procedure. A second adjustment was made to account for assisting surgeons. For some procedures the Panel felt that since more than one general surgeon would be required, the work requirements for these procedures would be increased. The Panel noted that these requirements for general surgeon assists could typically be met either by general surgeons or by residents in general surgery.

In addition to the time required for the performance of the surgical procedure, surgical norms of care include the associated inpatient and office visits per episode. For each procedure the Panel estimated the total number of associated inpatient and office visits required. These were aggregated across all conditions, as were surgery times to establish the total service requirements. Again, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by general surgeons was explicitly listed on the surgery care list. These calculations are summarized in Table III.D.3.

Table III.D.4 lists the surgical procedures which were the primary determinants of the general surgery workload, together with their overall share of the workload.

The Practice Profile--In order to convert the service requirements into manpower requirements it is necessary to have an estimate of the productivity of the average general surgeon. These estimates were derived from Panel estimates of a "typical practice profile," a description of the average annual practice of general surgeons. Table III.D.5 shows the productivity estimates derived from the estimated practice profile.

Table III.D.3

SERVICE REQUIREMENTS FOR GENERAL SURGEONS FOR SURGICAL CARE

A. Operative Component

$$S_{3A} = \left(\sum_p (R_p \cdot E_p \cdot F_p \cdot G_p)/6\right) \cdot 2435/f_2 = 16{,}749{,}267 \text{ hours:}$$

where

S_{3A} = service requirements;

R_p = surgery rate (per 100,000) for procedure p;

E_p = proportion of these which should be performed by general surgeons;

F_p = CRV weight for procedure p;

G_p = number of general surgeons at table;

f_2 = proportion of surgical workload represented by explicity considered procedures = .85; and

$\sum_p (R_p \cdot E_p \cdot F_p \cdot G_p)$ = 35,080.6 CRVs per 100,000.

B. Inpatient Visit Component

$$S_{3B} = \sum_p (R_p \cdot E_p \cdot N4_p) \cdot 2435/f_2 = 81{,}144{,}799 \text{ inpatient visits}$$

where

S_{3B} = service requirements;

$N4_p$ = number of associated inpatient visits per p; and

$\sum_p (R_p \cdot E_p \cdot N4_p)$ = 28,325.7 visits per 100,000

C. Office Visit Component

$$S_{3C} = \sum_p (R_p \cdot E_p \cdot N5_p) \cdot 2435/f_2 = 19{,}132{,}511 \text{ office visits:}$$

where

S_{3C} = service requirements;

$N5_p$ = number of associated office visits per p; and

$\sum_p (R_p \cdot E_p \cdot N5_p)$ = 6,678.7 visits per 100,000

Table III.D.4

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 GENERAL SURGERY WORKLOAD

ICDA	Procedure	Percent of Workload
43.5	Cholecystectomy	9.7
38.2	Repair of inguinal hernia except recurrent	5.3
47.5	Resection of colon, partial or subtotal	5.3
27.5	Reconstruction of intra-abdominal arteries by blood vessel graft	4.1
41.1	Appendectomy	4.0
A4.5	Endoscopy of colon and rectum without effect upon tissue or lesion	3.7
43.0	Incision of bile (hepatic) ducts	3.4
39.1	Exploratory laparotomy or celiotomy	3.4
	TOTAL	38.9%

Table III.D.5

THE ESTIMATED 1990 PRACTICE PROFILE OF GENERAL SURGEONS PRODUCTIVITY ESTIMATES

A. Annual hours worked:

46.0	(46-46)	Annual weeks worked
x 50.0	(50-56)	Weekly hours worked
2300.0		Annual hours worked = P_1

B. Annual full-time equivalent (FTE) office visits productivity:

2300.0		Annual hours worked
x 3.65	(2.9-5.3)	Office visits per hour
8395.0		Office visits per FTE year = P_2

C. Annual FTE inpatient visits productivity:

2300.0		Annual hours worked
x 4.1	(3.8-6.0)	Inpatient visits per hour
9430.0		Inpatient visits per FTE year = P_3

D. Percentage of time in "other professional time," i.e., not delivering care: 16.0 percent (12.0-16.0)

By dividing by the appropriate productivity factor, service requirements in each of the three categories discussed above were translated into requirements for full-time equivalent general surgeons. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required headcount: that was, to adjust for general surgeons who would be required to perform non-patient care tasks such as teaching, research, and administration. The Panel also estimated this factor, and it was used to inflate the full-time equivalents to the required headcount of general surgeons in 1990. Details of the calculations are presented in Table III-D.6; the number of general surgeons required in 1990 according to the Delphi Panel was 24,514.

Table III.D.6

FINAL REQUIREMENTS FOR GENERAL SURGEONS

$$N = \left(\frac{S_1 + S_{2B} + S_{3C}}{P_2} + \frac{S_{2A} + S_{3B}}{P_3} + \frac{S_{3A}}{P_1}\right)/(1-f_3) = 24,514$$

where

N = headcount of required general surgeons;

f3 = proportion of all general surgeons' time in non-patient care activities = .16

3. Modeling Panel Review of General Surgery Delphi Panel Estimates

After reviewing the output of the General Surgery Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.D.7.

The net effect of the Modeling Panel's recommendations was to reduce the estimated requirements for general surgeons from 24,514 to 23,097. The Committee essentially accepted this estimate. The Committee's recommendation for the number of general surgeons required in 1990 is 23,000-24,000.

Table III.D.7

MODELING PANEL RECOMMENDATIONS CONCERNING GENERAL SURGERY PANEL ESTIMATES

	Recommendation	Net Change in Number of General Surgeons Required
1.	Increase rate for ICDA procedure A4.3, bronchoscopy, from 100 to 120 and reduce share from 20 to 10%	-22
2.	Reduce share of A4.4, esophagoscopy & gastroscopy, from 20 to 15% and reduce rate from 150 to 140	-29
3.	Reduce share of 22.1, thyroidectomy, from 100 to 95%	-12
4.	Reduce rate of 24.0, incision of peripheral blood vessels, from 25 to 20, and reduce share from 95 to 90%	-58
5.	Reduce rate of 24.1, peripheral endarterectomy, from 9 to 7 and reduce share from 100 to 70%	-66
6.	Reduce share of 24.7, graft reconstruction of peripheral artery, from 100% to 70%	-143
7.	Increase rate of 25.2, radical excision of lymphatic structure, from 15 to 20, and reduce share from 90 to 45%	-54
8.	Reduce rate of 26.1, endarterectomy, head and neck, from 23 to 22, and increase share from 75 to 85%	+18
9.	Reduce share of 27.3, repair of abdominal aortic aneurysm, from 100 to 75%	-90
10.	Reduce share of 27.5, reconstruction of intra-abdominal arteries, from 100 to 75%	-151
11.	Reduce rate of 30.4, insertion of pacemaker, from 50 to 45, and reduce share from 20 to 10%	-35
12.	Reduce rate of 34.2-.4, lung procedures, from 20 to 19, and reduce share from 10 to 5%	-22
13.	Increase share of 38.2, hernia repair, from 95 to 100%	+66
14.	Reduce rate of 54.5, nephrectomy, from 19 to 18, and reduce share from 25 to 20%	-17

Table III.D.7 (continued)

	Recommendation	Net Change in Number of General Surgeons Required
15.	Increase rate of 59.1, excision of hydrocele and hematocele, from 34 to 35%	+2
16.	Reduce share of 59.7, orchiopexy, from 60 to 40%	-19
17.	Reduce share of 65.2, partial mastectomy, from 100 to 90%	-34
18.	Reduce rate of 65.7, repair or plastic operations on breast, from 15 to 10, and reduce share from 70 to 30%	-59
19.	Reduce rate of 82.0, closed reduction, from 152.5 to 145 (note HDS redefinition of ICDA code)	-5
20.	Reduce rate of 82.1, open reduction w/o fixation, from 45 to 40 (note HDS redefinition of ICDA code)	-2
21.	Increase rate of 82.2, closed or open reduction w/fixation, from 175 to 180 (note HDS redefinition of ICDA code)	+3
22.	Reduce rate of 85.7-.8, amputation of leg and thigh, from 27 to 25, and reduce share from 80 to 50%	-146
23.	Increase rate of 92.2, wide or radical excision of lesion of skin, from 21 to 30, and reduce share from 87.5 to 60%	-3
24.	Reduce rate of 92.5, suture of skin, from 1000 to 250, and increase share from 20 to 40%	-312
25.	Increase rate of ICDA 173, other malignant neoplasm of skin, from 180 to 1000, and reduce share from 40 to 10%	+18
26.	Reduce rate of 813, 815, 820, 823-825, fractures, from 1500 to 1174, and increase share from 5 to 10%	+75
27.	Reduce time for 43.5, cholecystectomy, from 3 to 2 hours	-320
	TOTAL	-1417

E. NEUROSURGERY

1. Overview

The Neurosurgery Delphi Panel noted that within the past decade there have been significant changes in the practice patterns of neurosurgeons. (This was reflected in a wide divergence among panel members in their own relative amounts of time spent in office versus hospital care.) These changes in practice patterns will probably continue in the 1980s so that estimates made for 1990 must be interpreted with caution.

A trend expected to have important manpower implications is team management of patient care, especially for trauma. With regional trauma centers, many conditions such as spinal, odontoids, and hangman's fractures will be seen by both neurosurgeons and orthopedists. Thus, the share of these patients seen by each specialty could well sum to over 100 percent, although the average number of visits provided by any single specialist might fall.

The Panel also noted the neurosurgery practice content is affected by legal issues, particularly by malpractice considerations. For example, neurosurgeons are probably seeing more concussions than is medically indicated because of extreme caution on the part of referring physicians. Similarly, concern over malpractice liability may limit the amount of work which can be delegated to nonphysician providers. Birth defects, pain, myelomeningocele and cervical disc displacement were all noted as conditions for which some visits for hospital care might be delegated to nonphysicians if malpractice were not a consideration. Physician's assistants and nurses could also replace residents as assistants for some surgical procedures. For a detailed discussion of the Neurosurgery Delphi Panel's estimates, see Wills and Garrison, 1980.

2. Documentation of Manpower Requirements Calculation

Manpower requirements in neurosurgery were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of neurosurgeons. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each service category. The sum of FTEs across service categories was then inflated to account for requirements for neurosurgeons to perform non-patient care tasks such as teaching, research, and administration.

Each step in the calculation is documented in detail below.

Service Requirements--The Neurosurgery Delphi Panel estimated service requirements in three categories, as follows:

-- Office visits;

-- Inpatient visits to nonsurgical, hospitalized patients; and

-- Surgical care, including both the performance of the procedure and the associated inpatient visits.

Office Visits--Service requirements for office visits were estimated by the Panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the incidence or prevalence rate (per 100,000 population) for the disease or condition was multiplied by the proportion of individuals with that condition who should be seen by a physician in 1990; this product was then multiplied by the proportion of those individuals who should be seen by a neurosurgeon. The proportion who should see a physician are those who should see a physician in a given year. Thus, for example, even if all individuals with a certain chronic condition should at some time or another see a physician, if once diagnosed they need to see a physician only every other year, then the proportion who should see a physician in 1990 is 50 percent.

Then, given the group of patients who should see a neurosurgeon in 1990, the Panel established for each patient with this condition, a norm of care, measured as the average required office visits per episode of the condition per year. Multiplying this norm by the number of patients in the group yields the total service requirements for office visits per 100,000 population for this condition.

The total requirements are the sum of those office visit rates across all conditions, multiplied by 2,435, since the 1990 Series II Census Projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by neurosurgeons. This was based on the Panel's estimate of the relative size of a residual category which included those other conditions not on the list but yet part of the overall workload. The service requirements for office visits are summarized in Table III.E.1.

Nonsurgical, Hospitalized Patients--Service requirements for nonsurgical, hospitalized patients were established as follows: For each condition the 1990 nonsurgical hospital admission rate was estimated. Background data on nonsurgical admissions from the Hospital Discharge Survey were used by the Panel in this process.

Once the nonsurgical admission rate had been established, the proportion of these admissions which should be seen by a neurosurgeon was estimated. The Panel then estimated the norms of care for these patients, in terms of the number of inpatient visits required per episode of the condition for hospitalized, nonsurgical patients.

Summing the required visits for each condition for this category across all conditions yields the total service requirements. Again, an adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of every condition neurosurgeons treat. The service requirements for nonsurgical, hospitalized patients are summarized in Table III.E.2.

Table III.E.1

SERVICE REQUIREMENTS FOR NEUROSURGEONS FOR OFFICE VISITS

$S_1 = \sum_c (I_c \cdot A_c \cdot B_c \cdot Nl_c) \cdot 2435/f_1 = 4,282,524$ office visits:

where

S_1 = service requirements;

I_c = morbidity rate (per 100,000) of condition c;

A_c = proportion of episodes of c which should be seen by a physician;

B_c = proportion of episodes seen by a physician which should be seen by a neurosurgeon;

Nl_c = number of annual office visits per episode of c for these conditions;

f_1 = proportion of total visit workload represented by the conditions explicitly considered = .95; and

$\sum_c (I_c \cdot A_c \cdot B_c \cdot Nl_c) = 1670.8$ visits per 100,000;

Table III.E.2

SERVICE REQUIREMENTS FOR NEUROSURGEONS FOR NONSURGICAL, HOSPITALIZED PATIENTS

$S_2 = \sum_c (D_c \cdot E_c \cdot N2_c) \cdot 2435/f_1 = 3{,}658{,}907$ inpatient visits:
where

$S_2 =$ service requirements;

$D_c =$ nonsurgical admission rate in 1990 for condition c;

$E_c =$ proportion of these patients who should be treated by a neurosurgeon;

$N2_c =$ annual inpatient visits per episode of c for these patients; and

$\sum_c (D_c \cdot E_c \cdot N2_c) = 1{,}427.5$ visits per 100,000.

The conditions which accounted for a significant proportion of the neurosurgery workload are shown in Table III.E.3.

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the 1990 rate (per 100,000 population) at which the surgical procedure should be performed, the proportion of these cases which should be done by a neurosurgeon, and the average time per procedure.

The time required to perform the procedure included not merely skin-to-skin time in the operating room, but also time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement per 100,000 population is simply the product of three factors: the procedure rate; the proportion to be done by neurosurgeons; and the time required to perform the procedure.

In addition to the time required for the performance of the surgical procedure, surgical norms of care included the associated inpatient visits per episode. For each procedure the Panel estimated the total number of associated inpatient visits that would be required for the surgical patient. These were aggregated across all conditions, as were surgery times, in order to establish the total service requirements. Also, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by neurosurgeons was explicitly listed on the surgery care list. These calculations are summarized in Table III.E.4.

The list of surgical procedures which constituted a significant portion of the neurosurgical workload is shown in Table III.E.5.

The Practice Profile--In order to convert the service requirements into manpower requirements, it is necessary to have an estimate of the productivity of the average neurosurgeon. These estimates were derived from Panel estimates of a "typical practice profile," a description of the average annual practice of neurosurgeons. Table III.E.6 shows the productivity estimates derived from the practice profile.

By dividing by the appropriate productivity factor, service requirements in each of the three categories discussed above were translated into requirements for full-time equivalent neurosurgeons. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required head count: that was, to adjust for neurosurgeons who would be required to perform nonpatient care tasks such as teaching, research, and administration. The Panel also estimated this factor and it was used to inflate the full-time equivalents to the required head count of neurosurgeons in 1990. Details of the calculations are presented in Table III.E.7. The number of neurosurgeons required in 1990 according to the Delphi Panel estimates was 2,496.

Table III.E.3

CONDITIONS ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 NEUROSURGERY WORKLOAD

	Percent of	
ICDA	Condition	Workload
725.1	Lumbar and lumbosacral displacement of disc	11.3
725.8	Displacement of disc, other specified site	
725.9	Displacement of disc, unspecified site	
854	Intracranial injury of other and unspecified nature	13.8
805,	Fracture and fracture dislocation of vertebral column without mention of spinal cord lesion	4.6
806,	Fracture and fracture dislocation of vertebral column with spinal cord lesion	
958	Spinal cord lesion without evidence of spinal bone injury	
191,	Malignant neoplasm of brain	5.0
198.3,	Malignant neoplasm of brain, specified as secondary	
238,	Neoplasm of unspecified nature of eye, brain, and other parts of nervous system	
225,	Benign neoplasm of brain and other parts of nervous system	
226.2,	Benign neoplasm of pituitary gland and craniopharyngeal duct (pouch)	
226.3	Benign neoplasm of pineal gland	
725.0	Cervical disc displacement	4.2
	TOTAL	38.9

Table III.E.4

SERVICE REQUIREMENTS FOR NEUROSURGEONS FOR SURGICAL CARE

A. Operative Component

$$S_{3A} = \sum_p (F_p \cdot G_p \cdot H_p) \cdot 2435/f_2 = 794{,}323 \text{ hours:}$$

where

S_{3A} = service requirements;

F_p = surgery rate per 100,000 for procedure p;

G_p = proportion of these procedures which should be performed by neurosurgeons;

H_p = door-to-door procedure time for procedure p;

f_2 = proportion of surgical workload represented by the explicitly considered procedures = .95; and

$\sum_p (F_p \cdot G_p \cdot H_p)$ = 309.9 hours per 100,000

B. Inpatient Visits Component

$$S_{3B} = \sum_p (F_p \cdot G_p \cdot I_p) \cdot 2435/f_2 = 3{,}020{,}425 \text{ inpatient visits:}$$

where

S_{3B} = service requirements;

I_p = inpatient visits per episode of p; and

$\sum_p (F_p \cdot G_p \cdot I_p)$ = 1178.4 visits per 100,000

Table III.E.5

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 NEUROSURGERY WORKLOAD

ICDA	Procedure	Percent of Workload
01.0	Incision and excision of skull and intracranial structures	9.8
86.4	Excision of intervertebral cartilage (prolapsed disk)	9.1
02.0	Other operations on brain and cerebral meninges	4.6
03.0-.3	Laminectomy; nerve root section, spinal; chordotomy; excision and destruction of lesion, spinal and intraspinal	3.4
	TOTAL	26.9%

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Table III.E.6

THE ESTIMATED 1990 PRACTICE PROFILE OF NEUROSURGEONS
PRODUCTIVITY ESTIMATES

A. Annual hours worked:

46.0 (44-48)	Annual weeks worked
x 54.0 (50-58)	Weekly hours worked
2484.0	Annual hours worked = P_3

B. Annual full-time equivalent (FTE) office visits productivity:

2484.0	Annual hours worked
x 1.7 (1.5-2.5)	Office visits per hour
4222.8	Office visits per FTE year = P_1

C. Annual FTE inpatient visits productivity:

2484.0	Annual hours worked
x 3.35 (1.1-6.0)	Inpatient visits per hour
8321.4	Inpatient visits per FTE year = P_2

D. Percent of time in "other professional time," i.e., not in office or hospital delivering care: 14.4% (8.9-18.9)

Table III.E.7

FINAL REQUIREMENTS FOR NEUROSURGEONS

$$N = \left(\frac{S_1}{P_1} + \frac{S_2 + S_{3B}}{P_2} + \frac{S_{3A}}{P_3}\right)/(1-f_3) = 2496:$$

where

N = head count of required neurosurgeons; and

f_3 = average proportion of all neurosurgeons' time in nonpatient care activities = .144

3. Modeling Panel Review of Neurosurgery Delphi Panel Estimates

After reviewing the output of the General Surgery Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.E.8.

The net effect of the Modeling Panel's changes was to increase the estimated requirements for neurosurgeons from 2,496 to 2,793. The Committee accepted this estimate. The Committee's recommendation for the number of neurosurgeons required in 1990 is 2,500-2,800.

Table III.E.8

MODELING PANEL RECOMMENDATIONS CONCERNING NEUROSURGERY PANEL ESTIMATES

	Recommendation	Net Change in Number of Neurosurgeons Required
1.	Increase rate for ICDA procedure 04 group, operations on peripheral nerves, from 90 to 100	+4
2.	Increase rate for 26.1, endarterectomy, head and neck, base of brain, from 21 to 22%	+1
3.	Increase rate for 87.4, spinal fusion, from 4 to 30, and reduce share from 90 to 15%. (This makes procedure definition consistent with Orthopedics Panel; these are not two independent changes.)	+7
4.	Increase morbidity rate for 725, 728, 383, 846, 847, back problems, from 2495 to 20,000; reduce the percent to see physician from 55 to 20% and the percent to see neurosurgeon from 13 to 3%. (Again, these are simultaneous changes designed to increase comparability with Orthopedics Panel estimates.)	-56
5.	Increase morbidity rate for 805, 806, 958, spinal fractures, from 50 to 75, and reduce share from 85 to 20%	-58
6.	Increase rate for 03, operations on spinal cord structure, from 11 to 20, and reduce share from 100 to 90%	+61
7.	Increase procedure time for 86.4, disc excision from 2 to 2.5 hours	+26
8.	Reduce workweek from 54 to 48 hours	+312
	TOTAL	+297

F. OPHTHALMOLOGY

1. Overview

The Ophthalmology Delphi Panel spent considerable time discussing the treatment of refractive errors. This was appropriate given that this condition leads to the largest total service requirements. Of course, the role of the optometry profession in the treatment of this condition was discussed at length.

Several trends were noted by the Delphi Panel as significant factors in determining future practice patterns. The increasing trend toward subspecialization within ophthalmology was identified as a key factor, though the Panel was uncertain of its ramifications. Increases in the diabetic population as the general population ages is expected to lead to increases in the rates for some surgical procedures. And, like the other specialties, ophthalmology is expected to experience a trend toward performing more and more surgery on an outpatient basis.

Finally, it should be noted that the projected 1990 workweek of 41.5 hours on average for ophthalmologists was the shortest of the surgical specialties. Although this estimate conforms to current conventional practice, the manpower implications of a longer workweek are significant. For a detailed description of the Ophthalmology Delphi Panel's estimates, see Wills and Garrison, 1980.

2. Documentation of Manpower Requirements Calculation

Manpower requirements in ophthalmology were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of ophthalmologists. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each service category. The sum of FTEs across service categories was then inflated to account for requirements for ophthalmologists to perform nonpatient care tasks such as teaching, research, and administration.

Each step in the calculation is documented in detail.

Service Requirements--The Ophthalmology Delphi Panel estimated service requirements in three categories, as follows:

- Office visits to nonsurgical patients;
- Surgical care, including both the performance of the procedure and the associated inpatient and office visits; and
- Inpatient visits to nonsurgical, hospitalized patients.

Nonsurgical Patients--Service requirements for nonsurgical, nonhospitalized patients were estimated by the Panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the incidence or prevalence rate (per 100,000 population) for the disease or condition was multiplied by the proportion of individuals with that condition who should receive care in 1990, either from a physician or another member of the "eye care team". This product was then multiplied by the proportion of those individuals who should be seen by the eye care team, which was defined to include ophthalmologists, optometrists, and ophthalmic assistants. The proportion who should receive care are those who should receive care in a given year. Thus, for example, even if all individuals with a certain chronic condition should at some time or another receive care, if once diagnosed they need to receive care only every other year, then the proportion who should receive care in 1990 is 50 percent.

Then, given the group of patients who should receive care from the eye care team in 1990, the Panel established for each condition what proportion of these episodes should be treated by the ophthalmologist entirely within the office; that is, not involving hospitalization. For each patient with this condition, a norm of care, measured as the average required office vists per episode of the condition per year, was established. Multiplying this norm by the number of individuals falling into the nonsurgical group yields the service requirements for visits per 100,000 population for this condition.

The total requirements were calculated by summing this office visit requirements across all conditions and multiplying by 2,435, since the 1990 Series II Census Projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by ophthalmologists. This was based on the Panel's estimate of the relative size of a residual category which included those other conditions. The service requirements for nonsurgical patients are summarized in Table III.F.1.

The list of conditions which contributed significantly to the ophthalmology workload is shown in Table III.F.2.

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the 1990 rate (per 100,000 population) at which the surgical procedure should be performed, the proportion of these cases which should be done by an ophthalmologist, and the average time per procedure.

The time required to perform the procedure included both skin-to-skin time in the operating room, and time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement for a given procedure per 100,000 population, then, is simply calculated by multiplying the procedure rate times the proportion to be done by ophthalmologists by the time required to perform the procedure.

Table III.F.1

SERVICE REQUIREMENTS FOR OPHTHALMOLOGISTS FOR OFFICE VISITS

$$S_1 = \sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot N1_c \cdot T1_c) \cdot 2435/f_1 = 22{,}719{,}952 \text{ hours:}$$

where

S_1 = service requirements;

I_c = morbidity rate (per 100,000) of condition c;

A_c = proportion of episodes of c which should receive care;

B_c = proportion of episodes receive care which should be seen by the eye care team;

C_c = proportion of episodes treated by the eye care team which should be handled by the ophthalmologist in the office;

$N1_c$ = number of annual office visits per episode of c for these patients;

$T1_c$ = time required per visit for c;

f_1 = proportion of total visit workload represented by the explicitly considered conditions = .955; and

$$\sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot N1_c \cdot T1_c) = 8{,}910.7 \text{ hours per 100,000;}$$

Table III.F.2

CONDITIONS ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 OPHTHALMOLOGY WORKLOAD

ICDA	Condition	Percent of Workload
370	Refractive errors	58.6
375,	Glaucoma	9.0
744.2,	Buphthalmos	
373,	Strabismus	
377.2	Amblyopia	
374,	Cataract	5.9
378.7,	Aphakia, acquired	
744.3,	Congenital cataract	
378.8	Other diseases of lens	
250.9	Diabetes mellitus without mention of acidosis or coma	3.6
	TOTAL	77.1%

In addition to the time required for the performance of the surgical procedure, surgical norms of care included the associated inpatient and office visits per episode. For each procedure the Panel estimated the total number of associated inpatient and office visits that would be required for the surgical patient, and the times required for these visits. These were aggregated across all conditions, as were surgery times, in order to establish the total service requirements. Again, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by ophthalmologists was explicitly listed on the surgery care list. These calculations are summarized in Table III.F.3.

The list of surgical procedures which contributed significantly to the ophthalmology workload is shown in Table III.F.4.

Nonsurgical, hospitalized patients--Care of nonsurgical, hospitalized patients occupies so small a part of the overall ophthalmology workload that the Delphi Panel chose to estimate service requirements in this category as a simple proportion of other requirements, rather than on condition-by-condition basis. The Panel estimated that inpatient visits to nonsurgical patients accounted for only one percent of all inpatient visits, and thus the service requirements for this category can be calculated directly from the service requirements for surgery-related inpatient visits, which is shown in Table III.F.3. This calculation is displayed in Table III.F.5.

Table III.F.3

SERVICE REQUIREMENTS FOR OPHTHALMOLOGISTS FOR SURGICAL CARE

A. Operative Component

$$S_{2A} = \sum_p (F_p \cdot G_p \cdot H_p) \cdot 2435/f_2 = 1{,}439{,}726 \text{ hours:}$$

where

S_{2A} = service requirements;

F_p = surgery rate (per 100,000) for procedure p;

G_p = proportion of these procedures which should be performed by ophthalmologists;

H_p = door-to-door procedure time for procedure p;

f_2 = proportion of surgical workload represented by the explicitly considered procedures = .95; and

$\sum_p (F_p \cdot G_p \cdot H_p) = 561.7$ hours per 100,000

B. Inpatient Visits Component

$$S_{2B} = \sum_p (F_p \cdot G_p \cdot I_p \cdot T2_p) \cdot 2435/f_2 = 497{,}509 \text{ hours:}$$

where

S_{2B} = service requirements;

I_p = inpatient visits per episode of p;

T_{2p} = time per inpatient visit; and

$\sum_p (F_p \cdot G_p \cdot I_p \cdot T2_p) = 194.1$ hours per 100,000

C. Office Visits Component

$$S_{2C} = \sum_p (F_p \cdot G_p \cdot J_p \cdot T3_p) \cdot 2435/f_2 = 1{,}122{,}407 \text{ hours:}$$

where

S_{2C} = service requirements;

J_p = office visits per episode of p;

$T3_p$ = time per office visit; and

$\sum_p (F_p \cdot G_p \cdot J_p \cdot T3_p) = 437.9$ hours per 100,000

Table III.F.4

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 OPHTHALMOLOGY WORKLOAD

ICDA	Procedure	Percent of Workload
14.0,	Discission of lens or cataract	6.5
14.4,	Extraction of lens, extracapsular	
14.5,	Extraction of lens, intracapsular	
14.6,	Other cataract extraction	
14.7	Other operations on lens	
	TOTAL	6.5%

Table III.F.5

SERVICE REQUIREMENTS FOR OPHTHALMOLOGISTS FOR INPATIENT VISITS TO NONSURGICAL PATIENTS

$$S_3 = S_{2B} \cdot \frac{f_3}{1-f_3} = 5{,}025 \text{ hours:}$$

where

S_3 = service requirements; and

f_3 = proportion of inpatient visits to nonsurgical patients of all inpatient visits = .01

The Practice Profile--In order to convert the service requirements into manpower requirements, it is necessary to have an estimate of the productivity of the average ophthalmologist. These estimates were derived from Panel estimates of a "typical practice profile," a description of the average annual practice of ophthalmologists. Table III.F.6 shows the productivity estimates derived from the estimated practice profile.

Table III.F.6

THE ESTIMATED 1990 PRACTICE PROFILE OF OPHTHALMOLOGISTS PRODUCTIVITY ESTIMATES

A. Annual hours worked:

47.0 (44-47) Annual weeks worked
x 41.5 (39.5-48)
Weekly hours worked

1950.5 Annual hours worked = P_1

B. Percent of time in "other professional time," i.e., not in office or hospital delivering care: 10% (7.3 -11.4)

By dividing by annual hours worked, service requirements in each of the three categories discussed above were translated into requirements for full-time equivalent ophthalmologists. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required head count: that was, to adjust for ophthalmologists who would be required to perform nonpatient care tasks such as teaching, research, and administration. The Panel also estimated this factor and it was used to inflate the full-time equivalents to the required head count of ophthalmologists in 1990. Details of the calculations are presented in Table III.F.7. The number of ophthalmologists required in 1990 according to the Delphi Panel was 14,688.

Table III.F.7

FINAL REQUIREMENTS FOR OPHTHALMOLOGISTS

$$N = \left(\frac{S_1 + S_{2A} + S_{2B} + S_{2C} + S_3}{P_1}\right)/(1-f_3) = 14{,}688:$$

where

N = head count of required ophthalmologists; and

f_3 = average proportion of all ophthalmologists' time in non-patient care activities = .10

3. Modeling Panel Review of Ophthalmology Delphi Panel Estimates

After reviewing the output of the Ophthalmology Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.F.8.

The net effect of the Modeling Panel's changes was to reduce the estimated requirements for ophthalmologists from 14,688 to 11,396. Because of some uncertainty concerning the strabismus and amblyopia morbidity rates, the Committee increased estimated requirements slightly. The Committee's recommendation for the number of ophthalmologists required in 1990 is 11,430-11,800.

Table III.F.8

MODELING PANEL RECOMMENDATIONS CONCERNING OPHTHALMOLOGY PANEL ESTIMATES

Recommendation	Net Change in Number of Ophthalmologists Required
1. Increase rate for ICDA procedure 14.4-.7, lens operations, from 182 to 206 (1977 rate)	+142
2. Reduce the percent that should receive care in 1990 for 370, refractive errors, from 50% to 33.3%	-2876
3. Reduce morbidity rate for 373, 377.2, strabismus and amblyopia, from 7000 to 5000, and reduce the percent that should receive care in 1990 from 16 to 8%	-558
TOTAL	-3292

Note: Although a recommendation was not made, the Modeling Panel pointed out that if the average ophthalmology work week were increased from 41.5 to 44 hours, the manpower requirements would fall by 835. The Modeling Panel also noted that if ophthalmologists worked more closely with optometrists or ophthalmic assistants, fewer ophthalmologists would be needed to do refractions.

G. ORTHOPEDIC SURGERY

1. Overview

The estimates of the Orthopedic Surgery Delphi Panel led to 1990 requirements for orthopedists which significantly exceed current supply. The principal source of the difference is in the number of office visits to be provided: the panel's estimates of implied office visits per 100,000 population per year was two and one-half times as high as the 1977 figure from the National Ambulatory Medical Care Survey. No single condition or set of conditions, however, can be identified as the cause of the increase. Another, but less important, factor in the difference is the relatively short projected work year of orthopedists: only 44 weeks per year (on average) in patient care in 1990. This is 2 to 3 weeks fewer than most of the other surgical specialties.

The Panel identified microsurgery as an emerging area which would be likely to increase orthopedic service requirements. Microsurgical procedures tend to take a long time and often require two teams of surgeons. Furthermore, improvement in microsurgical training and techniques will permit surgery to be performed in cases where none is now possible, including such procedures as free muscle transfers with vascular and neural connections, free and myocutaneous flap transfers, bone transplants with blood supply, and muscle transplants for correction of congenital or traumatic defects. For a detailed documentation of the Orthopedic Surgery Delphi Panel estimates, see Wills and Garrison, 1980.

2. Documentation of Manpower Requirements Calculation

Manpower requirements in orthopedic surgery were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of orthopedic surgeons. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each service category. The sum of FTEs across service categories was then inflated to account for requirements for orthopedic surgeons to perform non-patient care tasks such as teaching, research, and administration.

Each step in the calculation is documented in detail.

Service Requirements--The Orthopedic Surgery Delphi panel estimated service requirements in three categories, as follows:

- -- Office visits to nonsurgical, nonhospitalized patients;
- -- Office and inpatient visits to nonsurgical, hospitalized patients; and
- -- Surgical care, including both the performance of the procedures and the associated inpatient and office visits.

Nonsurgical, Nonhospitalized Patients. Service requirements for nonsurgical, nonhospitalized patients were estimated by the Panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the incidence or prevalence rate (per 100,000 population) for the disease or condition was multiplied by the proportion of individuals with that condition who should be seen by a physician in 1990; this product was then multiplied by the proportion of those individuals who should be seen by an orthopedic surgeon. The proportion who should see a physician are those who should see a physician in a given year. Thus, for example, even if all individuals with a certain chronic condition should at some time or another see a physician, if once diagnosed they need to see a physician only every other year, then the proportion who should see a physician in 1990 is 50 percent.

Then, given the group of patients who should see an orthopedic surgeon in 1990, the Panel established for each condition what proportion of the episodes should be treated entirely within the physician's office; that is, not involving hospitalization or surgery. For these patients with a given condition, a norm of care, measured as the average required office visits per episode per year, was estimated. Then, multiplying this norm by the number of individuals falling into the nonsurgical, nonhospitalized group yields the service requirements for office visits per 100,000 population for this condition.

The total requirements are the sum of these office visits rates across all conditions, multiplied by 2,435, since the 1990 Series II Census Projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by orthopedic surgeons. This was based on the Panel's estimate of the relative size of a residual category which included those other conditions not on the list but yet part of the overall workload. The service requirements for nonsurgical, nonhospitalized patients are summarized in Table III.G.1.

Nonsurgical, Hospitalized Patients--Service requirements for nonsurgical, hospitalized patients were established as follows: For each condition the 1990 nonsurgical hospital admission rate was estimated. Background data on nonsurgical admissions from the Hospital Discharge Survey were used by the Panel in this process.

Once the nonsurgical admission rate had been established, the proportion of these admissions which should be seen by an orthopedic surgeon was estimated. The Panel then estimated the norms of care for these patients. The norms of care specified both the required number of inpatient visits per episode of the condition, and the associated number of office visits required. The product of these factors is the required inpatient visits and office visits per 100,000 population for orthopedic surgeons to treat the nonsurgical, hospitalized patients with a given condition.

Table III.G.1.

SERVICE REQUIREMENTS FOR ORTHOPEDIC SURGEONS FOR NONSURGICAL, NONHOSPITALIZED PATIENTS

$S_1 = \sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot N1_c) \cdot 2435/f_1 = 49{,}996{,}834$ office visits:

where

S_1 = service requirements;

I_c = morbidity rate (per 100,000) of condition c;

A_c = proportion of episodes of c which should be seen by a physician;

B_c = proportion of episodes seen by a physician which should be seen by an orthopedic surgeon;

C_c = proportion of episodes treated exclusively in the office;

$N1_c$ = number of annual office visits per episode of c for these patients;

f_1 = proportion of total visit workload represented by the explicitly considered conditions = .93; and

$\sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot N1_c) = 19{,}095.3$ visits per 100,000.

Summing the required visits for each condition for this category of patients across all conditions yields the total service requirements. Again, an adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of every condition orthopedic surgeons treat. The service requirements for nonsurgical, hospitalized patients are summarized in Table III.G.2.

Table III.G.2.

SERVICE REQUIREMENTS FOR ORTHOPEDIC SURGEONS FOR NONSURGICAL, HOSPITALIZED PATIENTS

A. Inpatient Component

$$S_{2A} = \sum_c (D_c \cdot E_c \cdot N2_c) \cdot 2435/f_1 = 5{,}528{,}759 \text{ inpatient visits:}$$

where

S_{2A} = service requirements;

D_c = nonsurgical admission rate in 1990 for condition c;

E_c = proportion of these patients who should be treated by an orthopedic surgeon;

$N2_c$ = annual inpatient visits per episode of c for these patients; and

$\sum_c (D_c \cdot E_c \cdot N2_c)$ = 2111.6 inpatient visits per 100,000.

B. Office Component

$$S_{2B} = \sum_c (D_c \cdot E_c \cdot N3_c) \cdot 2435/f_1 = 4{,}148{,}141 \text{ office visits:}$$

where

S_{2B} = service requirements;

$N3_C$ = annual office visits per episode of c for these patients; and

$\sum_c (D_c \cdot E_c \cdot N3_c)$ = 1584.3 office visits per 100,000.

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the following parameters: the 1990 rate (per 100,000 population) at which the surgical procedure should be performed; the proportion of these which should be done by an orthopedic surgeon; and the average time per procedure.

The time required to perform the procedure included not merely skin-to-skin time in the operating room, but also time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement for a given procedure per 100,000 population is simply the product of these factors, which was calculated by multiplying the procedure rate by the proportion to be done by orthopedic surgeons, and that by the time required to perform the procedure.

The conditions which accounted for a significant portion of the orthopedic surgery workload are shown in Table III.G.3.

Table III.G.3.

CONDITIONS ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 ORTHOPEDIC SURGERY WORKLOAD

ICDA	Condition	Percent of Workload
725,	Displacement of intervertebral disc	3.2%
353,	Sciatica	
728,	Vertebrogenic pain syndrome	
846,	Sprains and strains of sacroiliac region	
847	Sprains and strains of other unspecified parts of back	
813	Fracture of radius and ulna	3.0
	TOTAL	6.2%

Because not all procedures are primary procedures, some are secondary to others, a further adjustment was made. For each of several procedures, the Panel estimated the proportion of times it is performed as a secondary rather than the primary procedure. Since giving these cases the time required as a primary procedure would lead to an overestimate of service requirements, the Panel adopted the following convention: For secondary procedures the time required would equal 75 percent of the time specified to perform them as primary procedures. However, no additional visits are to be added when a procedure is performed as a secondary procedure. Whenever a procedure is performed as a secondary procedure a significant portion of the time, this adjustment has been made. This affected a relatively small number of procedures.

In addition to the time required for the performance of the surgical procedure, surgical norms of care included associated inpatient and office visits per episode. For each procedure the Panel estimated the total number of associated inpatient and office visits that would be required for the surgical patient. These were aggregated across all procedures, as were surgery times, in order to estimate the total service requirements. Again, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by orthopedic surgeons was explicitly listed on the surgery care list. These calculations are summarized in Table III.G.4.

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Table III.G.4.

SERVICE REQUIREMENTS FOR ORTHOPEDIC SURGEONS FOR SURGICAL CARE

A. Operative Component

$$S_{3A} = \sum_p (F_p \cdot G_p \cdot H_p) \cdot 2435/f_2 = 6{,}877{,}978 \text{ hours:}$$

where

S_{3A} = service requirements;

F_p = surgery rate (per 100,000) for procedure p;

G_p = proportion of these procedures which should be performed by orthopedic surgeons;

H_p = door-to-door procedure time for procedure p;

f_2 = proportion of surgical workload represented by the explicitly considered procedures = .95; and

$\sum_p (F_p \cdot G_p \cdot H_p)$ = 2683.4 hours per 100,000

B. Inpatient Visits Component

$$S_{3B} = \sum_p (F_p \cdot G_p \cdot I_p) \cdot 2435/f_2 = 27{,}736{,}444 \text{ inpatient visits:}$$

where

S_{3B} = service requirements;
I_p = inpatient visits per episode of p; and
$\sum_p (F_p \cdot G_p \cdot I_p)$ = 10,821.2 visits per 100,000

C. Office Visits Component

$$S_{3C} = \sum_p (F_p \cdot G_p \cdot J_p) \cdot 2435/f_2 = 25{,}018{,}728 \text{ office visits:}$$

where

S_{3C} = service requirements;
J_p = office visits per episode of p; and
$\sum_p (F_p \cdot G_p \cdot J_p)$ = 9760.9 visits per 100,000

The procedures which accounted for a significant portion of the orthopedic surgery workload are shown in Table III.G.5.

Table III.G.5.

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 ORTHOPEDIC SURGERY WORKLOAD

ICDA	Procedure	Percent of Workload
82.2*	Reduction (closed or open) of fracture with mention of fixation	11.1
87.3	Repair and plastic operations on other joints	6.8
86.0, 86.1, 86.3	Arthrotomy Division of capsule, cartilage or ligament Excision and destruction of lesion of joint	6.5
82.0*	Reduction (closed or NOS) of fracture without mention of fixation	3.6
86.5	Excision of semilunar cartilage of knee joint	3.4
88.1, 88.2, 88.3, 88.4	Division of muscle, tendon and fascia Excision of lesion of muscle, tendon and fascia Resection of muscle, tendon, fascia and bursa Suture of muscle, tendon and fascia	3.3
80.5	Ostectomy, complete	3.1
	TOTAL	41.4%

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*Note HDS redefinition of ICDA Code

The Practice Profile--In order to convert the service requirements into manpower requirements, it is necessary to have an estimate of the expected 1990 productivity of the average orthopedic surgeon. These estimates were derived from Panel estimates of a "typical practice profile," a description of the average annual practice of orthopedic surgeons. Table III.G.6. shows the productivity estimates derived from the profile.

Table III.G.6.

THE ESTIMATED 1990 PRACTICE PROFILE OF ORTHOPEDIC SURGEONS
PRODUCTIVITY ESTIMATES

A. Annual hours worked:

44 (44-46)	Annual weeks worked
x 50 (48-53)	Weekly hours worked
2200	Annual hours worked = P_3

B. Annual full-time equivalent (FTE) office visits productivity:

2200	Annual hours worked
x 3.73*	Office visits per hour (see text)
8207	Office visits per FTE year = P_1

C. Annual FTE inpatient visits productivity:

2200	Annual hours worked
x 3.6 (3.3-7.0)	Inpatient visits per hour
7920	Inpatient visits per FTE year = P_2

D. Percent of time in "other professional time," i.e., not in office or hospital delivering care: 13.8% (10.5-16.0)

By dividing by the appropriate productivity factor, service requirements in each of the three categories discussed above were translated into requirements for full-time equivalent orthopedic surgeons. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required head count: that was, to adjust for orthopedic surgeons who would be required to perform nonpatient care tasks such as teaching, research, and administration. The Panel also estimated this factor and it was used to inflate the full-time equivalents to the required head count of orthopedic surgeons in 1990. Details of the calculations are presented in Table III.G.7. The number of orthopedic surgeons required in 1990 according to the Delphi Panel was 19,688.

Table III.G.7

FINAL REQUIREMENTS FOR ORTHOPEDIC SURGEONS

$$N = \left(\frac{S_1 + S_{2B} + S_{3C}}{P_1} + \frac{S_{2A} + S_{3B}}{P_2} + \frac{S_{3A}}{P_3}\right)/(1-f_3) = 19,688:$$

where

N = head count of required orthopedic surgeons; and

f_3 = proportion of all orthopedic surgeons' time in non-patient care activities = .138

3. Modeling Panel Review of Orthopedic Surgery Delphi Panel Estimates

After reviewing the output of the Orthopedic Surgery Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.G.8.

The net effect of the Modeling Panel's changes was to reduce the estimated requirements for orthopedic surgeons from 19,688 to 14,821. The Committee accepted this estimate. The Committee's recommendation for the number of orthopedic surgeons required in 1990 is 14,700-15,500.

Table III.G.8.

MODELING PANEL RECOMMENDATIONS CONCERNING ORTHOPEDIC SURGERY PANEL ESTIMATES

Recommendation	Net Change in Number of Orthopedic Surgeons Required
1. Reduce rate of ICDA procedure 03.0, laminectomy (excluding for disc), from 25 to 20, and reduce share from 25 to 10%	-67
2. Reduce rate for 04 group, operations on peripheral nerves, from 147.5 to 100, and increase share from 43% (weighted average) to 75%	+70
3. Increase rate of 82.0, closed reduction, from 140 to 145 (note HDS redefinition of ICDA code) and reduce share from 90 to 80%	-72
4. Increase rate of 82.1, open reduction without fixation, from 30 to 40 (note HDS redefinition of ICDA code) and reduce share from 100 to 95%	+75
5. Reduce rate of 82.2, closed or open reduction with fixation, from 200 to 180 (note HDS redefinition of ICDA code) and reduce share from 100 to 95%	-327
6. Increase rate of 85.7-.8, amputation of leg and thigh, from 24.5 to 25, and reduce share from 75 to 50%	-83
7. Increase rate of 86.4, disc excision, from 79 to 80	+5
8. Reduce share of 87.4, spinal fusion, from 100 to 85%	-76
9. Reduce rate of 89.1-.3, hand operations, from 50 to 40, and reduce share from 77.5 to 75%	-79
10. Reduce share of 805, 806, spinal column fracture, from 100 to 70%	-8

Table III.G.8. (Continued)

Recommendation	Net Change in Number of Orthopedic Surgeons Required
11. Reduce rate of 86.0-.3, arthrotomy, and related procedures from 150 to 100	-301
12. Reduce time required for 86.5, excision of cartilage of knee, from 2 to 1.5 hours	-54
13. Increase office visit rate from 3.73 to 5 per hour	-2449
14. Increase weeks worked per year from 44 to 46	-846
15. Reduce surgery times as follows:	

Procedure	Delphi estimate of time required	Modeling Panel estimate	
87.0,.1	2.75	2.5	
87.2	1.625	1.25	
87.3	3.0	2.0	
87.5	2.75	2.5	
87.7	1.5	1.0	
87.4	4.0	3.5	
03.0	3.5	3.0	
86.4	2.5	2.0	
86.0, .1, .3	2.0	1.5	
86.5	2.0	1.5	
82.1*	2.0	1.5	
82.2*	2.875	2.5	
80.0	1.875	1.5	
80.1, .2, .3	2.125	2.0	
80.4	2.5	2.0	
80.6	2.375	2.0	
80.8	1.5	1.0	
85.7, .8	2.5	2.0	
89.1, .2, .3	2.5	2.0	
04.4	3.0	2.5	
Microsurgical procedure	6.0	5.0	
Diagnostic otoscopy	1.5	1.0	-655

*HDS recode of ICDA-8 classification

TOTAL	-4867

H. OTOLARYNGOLOGY

1. Overview

The Otolaryngology Delphi Panel noted several trends in practice patterns that would be significant factors in determining 1990 manpower requirements. Younger otolaryngologists, for example, are becoming more involved in the treatment of hay fever, and this could become a significant workload determinant. Also, the declining rate at which tonsillectomies and adenoidectomies have been performed in recent years (from 504 per 100,000 in 1971 to 334 per 100,000 in 1977) is a trend which the Panel felt has now largely "bottomed out," although they did note that relatively more adenoidectomies without tonsillectomies would be performed in coming years. Continued treatment of patients with hearing loss was deemed valuable because technology is changing rapidly in this field, and patients who cannot be helped immediately may very well be helped in a few years. (Some of this workload would presumably be shared with audiologists, however.) As with other Panels, the otolaryngologists noted an increasing tendency to perform some surgical procedures (such as removal of nasal polyps) in outpatient or office settings, or in "surgi-centers."

The practice of otolaryngology is highly sensitive to local conditions especially with respect to referral patterns. This means that in some areas the specialty provides relatively more "primary" care than in other areas; if the specialty develops in the direction of a true "secondary" specialty, workload will be reduced because many conditions can be treated by family and general practitioners. Also, otolaryngologists do a fair amount of elective surgery, and the workload that arises from this will be sensitive to third-party reimbursement practices.

In general, the Panel felt that an increased number of otolaryngologists would be required, although the exact magnitude of the increase was unclear. This is consistent with an American Council of Otolaryngology report which states that there has been a consistent excess of otolaryngology positions over applicants for the past two years. 1/

For a detailed documentation of the Otolaryngology Delphi panel estimates, see Wills and Garrison, 1980.

1/ Press Release, American Council of Otolaryngology, n.d. (apparently August 1979).

2. Documentation of Manpower Requirements Calculation

Manpower requirements in otolaryngology were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of otolaryngologists. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each service category. The sum of FTEs across service categories was then inflated to account for requirements for otolaryngologists to perform non-patient care tasks such as teaching, research, and administration.

Each step in the calculation is documented in detail below.

a. Service Requirements--The Otolaryngology Delphi Panel estimated service requirements in three categories, as follows:

-- Office visits by nonsurgical patients;

-- Surgical care, including both the performance of the procedure and associated inpatient and office visits; and

-- Inpatient visits to nonsurgical, hospitalized patients.

Office Visits to Nonsurgical Patients--Service requirements for office visits by nonsurgical patients were estimated by the Panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the expected incidence or prevalence rate (per 100,000 population) for the disease or condition was multiplied by the proportion of individuals with that condition who should be seen by a physician in 1990; this product was then multiplied by the proportion of those individuals who should be seen by an otolaryngologist. The proportion who should see a physician are those who should see a physician in a given year. Thus, for example, even if all individuals with a certain chronic condition should at some time or another see a physician, if once diagnosed they need to see a physician only every other year, then the proportion who should see a physician in 1990 is 50 percent.

Then, given the group of patients who should see an otolaryngologist in 1990, the Panel established for each condition what proportion of the episodes should be nonsurgical. For each nonsurgical patient with a given condition, a norm of care, measured as the average required office visits per episode per year, was estimated. Multiplying this norm by the number of individuals falling into the nonsurgical group yields the total service requirements for office visits per 100,000 population for this condition.

The total requirements are the sum of these office visit rates across all conditions multiplied by 2435, since the 1990 Series II Census Projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by otolaryngologists. This was based on the Panel's estimates of the relative size of a residual category which included those other conditions not on the list but yet part of the overall workload. The service requirements for nonsurgical patients are summarized in Table III.H.1.

The conditions which contributed significantly to the otolaryngology workload are shown in Table III.H.2.

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the following parameters: the 1990 rate (per 100,000 population) at which the surgical procedure should be performed; the proportion of these which should be done by an otolaryngologist; and the average time per procedure.

The time required to perform the procedure included not merely skin-to-skin time in the operating room, but also time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement for a given procedure per 100,000 population is simply the product of these factors, which is calculated by multiplying the procedure rate by the proportion to be done by otolaryngologists, and that by the time required to perform the procedure.

Because some procedures are primary procedures while some are secondary to others, a further adjustment was made. For several procedures, the Panel estimated the proportion of times it is performed as a secondary rather than the primary procedure. Since giving these cases the time required as a primary procedure would lead to an overestimate of service requirements, the Panel adopted the following convention: For secondary procedures the time required would equal 50 percent of the time specified to perform them as primary procedures. For the most part, no additional visits were added for those cases where a procedure is performed as a secondary procedure. Whenever a procedure is performed as a secondary procedure a significant portion of the time, however, this adjustment has been made. This adjustment affected only a small number of procedures.

In addition to the time required for the performance of the surgical procedure, surgical norms of care included associated inpatient and office visits per episode. For each procedure the Panel estimated the total number of associated inpatient and office visits that would be required for the surgical patient. These were aggregated across all procedures, as were surgery times, in order to estimate the total service requirements. Again, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by otolaryngologists was explicitly listed on the surgery care list. These calculations are summarized in Table III.H.3

Table III.H.1

SERVICE REQUIREMENTS FOR OTOLARYNGOLOGISTS FOR OFFICE VISITS TO NONSURGICAL PATIENTS

$S_1 = \sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot Nl_c) \cdot 2435/f_1 = 45{,}596{,}791$ office visits:

where

S_1 = service requirements;

I_c = morbidity rate (per 100,000) of condition c;

A_c = proportion of episodes of c which should be seen by a physician;

B_c = proportion of episodes seen by a physician which should be seen by an otolaryngologist;

C_c = proportion of episodes treated nonsurgically;

Nl_c = number of annual office visits per episode of c for these patients;

f_1 = proportion of total visit workload represented by the explicitly considered conditions = .86; and

$\sum_c (I_c \cdot A_c \cdot B_c \cdot C_c \cdot Nl_c) = 16{,}104$ visits per 100,000.

Table III,H.2

CONDITIONS ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 OTOLARYNGOLOGY WORKLOAD

ICDA	Condition	Percent of Workload
384,	Other inflammatory diseases of ear	12.2
385,	Meniere's disease	
780.5	Vertigo	
386,	Otosclerosis	9.7
389	Other deafness	
380	Otitis externa	8.2
381,	Otitis media without mention of mastoiditis	6.6
382	Otitis media with mastoiditis	
506,	Chronic laryngitis	4.4
783.5,	Change in voice	
783.6	Stridor	
387	Other diseases of ear and mastoid process	4.3
503	Chronic sinusitis	3.8
460,	Acute nasopharyngitis	3.6
461,	Acute sinusitis	
462,	Acute pharyngitis	
463,	Acute tonsillitis	
464,	Acute laryngitis and tracheitis	
465	Acute upper respiratory infection of multiple or unspecified sites	
	TOTAL	52.8%

Table III.H.3

SERVICE REQUIRMENTS FOR OTOLARYNGOLOGISTS FOR SURGICAL CARE

A. Operative Component

$$S_{2A} = \sum_p (F_p \cdot G_p \cdot H_p) \cdot 2435/f_2 = 2{,}828{,}611 \text{ hours:}$$

where

S_{2A} = service requirements;

F_p = surgery rate (per 100,000) for procedure p;

G_p = proportion of these procedures which should be performed by otolaryngologists;

H_p = door-to-door procedure time for procedure p;

f_2 = proportion of surgical workload represented by the explicitly considered procedures = .85; and

$\sum_p (F_p \cdot G_p \cdot H_p)$ = 987.4 hours per 100,000

B. Inpatient Visits Component

$$S_{2B} = \sum_p (F_p \cdot G_p \cdot I_p) \cdot 2435/f_2 = 4{,}845{,}077 \text{ inpatient visits:}$$

where

S_{2B} = service requirements;

I_p = inpatient visits per episode of p; and

$\sum_p (F_p \cdot G_p \cdot I_p)$ = 1691.3 visits per 100,000.

C. Office Visits Component

$$S_{2C} = \sum_p (F_p \cdot G_p \cdot J_p) \cdot 2435/f_2 = 2{,}609{,}174 \text{ office visits:}$$

where

S_{2C} = service requirements;

J_p = office visits per episode of p; and

$\sum_p (F_p \cdot G_p \cdot J_p)$ = 910.8 visits per 100,000.

The list of procedures which contributed significantly to the otolaryngology workload are shown in Table III.H.4.

Nonsurgical Hospitalized Patients--Care of nonsurgical, hospitalized patients occupies so small a part of the overall otolaryngology workload that the Delphi Panel agreed to estimate service requirements in this category as a simple residual, rather than on a condition-by-condition basis. The Panel estimated that inpatient visits to nonsurgical patients accounted for only 5 percent of all inpatient visits, and thus the service requirements for this category can be calculated directly from the service requirements for surgery-related inpatient visits, shown in Table III.H.3. This calculation is displayed in Table III.H.5.

The Practice Profile--In order to convert the service requirements into manpower requirements it is necessary to have an estimate of the productivity of the average otolaryngologist. These estimates were derived from Panel estimates of a "typical practice profile," a description of the average annual practice of otolaryngologists. Table III.H.6 shows the productivity estimates derived from the profile.

By dividing by the appropriate productivity factor, service requirements in each of the three categories discussed above were translated into requirements for full-time equivalent otolaryngologists. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required head count: that was, to adjust for otolaryngologists who would be required to perform non-patient care tasks such as teaching, research, and administration. The Panel also estimated this factor and it was used to inflate the full-time equivalents to the required head count of otolaryngologists in 1990. Details of the calculations are presented in Table III.H.7. The number of otolaryngologists required in 1990 according to Delphi Panel was 9732.

3. Modeling Panel Review of Otolaryngology Delphi Panel Estimates

After reviewing the output of the Otolaryngology Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.H.8.

The net effect of the Modeling Panel's recommendations was to reduce the estimated requirements for otolayrngologists from 9,732 to 7,779. Because of some uncertainty regarding the incidence rate of otitis media, the Committee increased this slightly, and recommended 7,900-8,100 otolaryngologists as required in 1990.

Table III.H.4

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 OTOLARYNGOLOGY WORKLOAD

ICDA	Procedure	Percent of Workload
21.2	Tonsillectomy with adenoidectomy	5.2
19.3	Rhinoplasty and repair of nose	3.9
21.1	Tonsillectomy without adenoidectomy	3.2
	TOTAL	12.3%

Table III.H.5.

SERVICE REQUIREMENTS FOR OTOLARYNGOLOGISTS FOR INPATIENT VISITS TO NONSURGICAL PATIENTS

$$S_3 = S_{2B} \cdot \frac{f_3}{1-f_3} = 255{,}004 \text{ inpatient visits:}$$

where

S_3 = service requirements; and

f_3 = proportion of all inpatient visits which are to nonsurgical patients = .05

Table III.H.6

THE ESTIMATED 1990 PRACTICE PROFILE OF OTOLARYNGOLOGISTS PRODUCTIVITY ESTIMATES

A. Annual hours worked:

47	(47-47)	Annual weeks worked
x45.1	(45.1-51)	Weekly hours worked
2119.7		Annual hours worked = P_1

B. Annual full-time equivalent (FTE) office visits productivity:

2119.7		Annual hours worked
x 4.0	(3.6-5.2)	Office visits per hour
8478.8		Office visits per FTE year = P_2

C. Annual FTE inpatient visits productivity:

2119.7		Annual hours worked
x 2.0	(1.8-2.7)	Inpatient visits per hour
4239.4		Inpatient visits per FTE year = P_3

D. Percent of time in "other professional time," i.e., not in office or hospital delivering care: 15.5% (14.0-15.6)

Table III.H.7

FINAL REQUIREMENTS FOR OTOLARYNGOLOGISTS

$$N = \left(\frac{S_1 + S_{2C}}{P_2} + \frac{S_{2B} + S_3}{P_3} + \frac{S_{2A}}{P_1}\right)/(1-f_3) = 9732;$$

where

N = head count of required otolaryngologists; and

f_3 = proportion of all otolaryngologists' time in non-patient care activities = .155

Table III.H.8

MODELING PANEL RECOMMENDATIONS CONCERNING OTOLARYNGOLOGY PANEL ESTIMATES

	Recommendation	Net Change in Number of Otolaryngologists Required
1.	Reduce rate for ICDA procedure A4.3, bronchoscopy, from 125 to 120, and reduce share from 35 to 15%	-67
2.	Increase rate for 19.3, rhinoplasty, from 100 to 120, and reduce share from 55 to 50%	+30
3.	Increase rate for 22.1, thyroidectomy, from 29.5 to 30, and reduce share from 25 to 5%	-48
4.	Reduce share of 25.2, radical excision of lymphatic structure, from 75 to 45%	-74
5.	Increase rate for 92.1, local excision of skin, from 200 to 500, and reduce share from 15 to 5%	-14
6.	Reduce share of 94.3, rhytidectomy, from 30 to 10%	-28
7.	Increase share of 21 group, tonsillectomies and adenoidectomies, from 88 to 95%	+87
8.	Reduce share of 384, 385, 780.5, inflammatory diseases of ear, Meniere's disease, and vertigo, from 60 to 30%	-595
9.	Reduce share of 380, otitis externa, from 35 to 5%	-689
10.	Reduce rate for 381, 382, otitis media, from 6000 to 5000, and reduce share from 11 to 10%	-158
11.	Reduce the percent to see physician for 387.1, wax in ear, from 90% to 10% and reduce share from 20 to 10%	-148
12.	Reduce share of 503, chronic sinusitis, from 75 to 25%	-249
	TOTAL	-1953

I. Plastic Surgery

1. Overview

The Plastic Surgery Delphi Panel stressed the great and rapid changes which have taken place in the practice of plastic surgery in the past decade. One major trend of recent years has been the increased performance of surgical procedures in the office or an outpatient setting. As a result, practice profiles drawn from data even a few years old are likely to be inaccurate.

This circumstance posed two problems for the Panel. First, it made the distinction between inpatient and office visits associated with each surgical procedure impossible. The Panel dealt with this by simply estimating total associated visits, without specifying where they took place. Then, to allow for the fact that productivity (visits per hour) differs in the office and the hospital, the Panel estimated the proportion of all visits which would occur in the hospital, aggregating across all conditions. This permitted the calculation of the required productivity parameter (see Table III.I.5 on p. 170.)

The second problem raised by the trend toward office surgery has to do with the estimates of procedure rates. The principal source of background data for this parameter was the Hospital Discharge Survey. But, this survey does not count procedures performed outside of hospitals. The Panel adjusted for this omission in its estimates of 1990 surgery rates.

Further difficulties were caused by the substantial regional variation in plastic surgery practice, and by the presence of many elective procedures in the workload. The migration of the population to the South and West was foreseen to cause substantial increases in the incidence of conditions such as malignant neoplasms of skin. The rate at which procedures such as cosmetic surgery will be performed will be sensitive to reimbursement considerations. For a detailed documentation of the Plastic Surgery Delphi Panel, see Wills and Garrison, 1980.

2. Documentation of Manpower Requirements Calculation

Manpower requirements in plastic surgery were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of plastic surgeons. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each service category. The sum of FTEs across service categories was then inflated to account for requirements for plastic surgeons to perform non-patient care tasks such as teaching, research, and administration.

Each step in the calculation is documented in detail below.

Service Requirements--The Plastic Survey Delphi Panel estimated service requirements in two categories, as follows:

-- Visits to nonsurgical patients;

-- Surgical care, including both the performance of the procedures and the associated visits.

Nonsurgical Patients--Service requirements for nonsurgical patients were estimated by the Panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the expected 1990 incidence or prevalence rate (per 100,000 population) for the disease or condition was multiplied by the proportion of individuals with that condition who should be seen by a physician in 1990; this product was then multiplied by the proportion of those individuals who should be seen by a plastic surgeon. The proportion who should see a physician are those who should see a physician *in a given year*. Thus, for example, even if all individuals with a certain chronic condition should at some time or another see a physician, if once diagnosed they need to see a physician only every other year, then the proportion who should see a physician in 1990 is 50 percent.

Then, given the group of patients who should see a plastic surgeon in 1990, the Panel established for each condition what proportion of the episodes should be treated nonsurgically. For these patients with a given condition, a norm of care, measured as the average required visits per episode per year, was established. Then, multiplying this norm by the number of individuals falling into the nonsurgical group yields the total service requirements for visits per 100,000 population for this condition.

The total requirements are the sum of these visit rates across all conditions multiplied by 2,435, since the 1990 Series II Census Projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by plastic surgeons. This was based on the Panel's estimate of the relative size of a residual category which included those other conditions not on the list but yet part of the overall workload. The service requirements for nonsurgical patients are summarized in Table III.I.1.

The conditions which contributed significantly to the plastic surgery workload are shown in Table III.I.2.

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the following parameters: the 1990 rate (per 100,000 population) at which the surgical procedure should be performed; the proportion of these cases which should be done by a plastic surgeon; and the average time per procedure.

Table III.I.1

SERVICE REQUIREMENTS FOR PLASTIC SURGEONS FOR NONSURGICAL PATIENTS

$S_1 = \Sigma(I_c \cdot A_c \cdot B_c \cdot C_c \cdot N1_c) \cdot 2435/f_1 = 4{,}364{,}061$ visits:

where

S_1 = service requirements;

I_c = morbidity rate (per 100,000) of condition c;

A_c = proportion of episodes of c which should be seen by a physician;

B_c = proportion of episodes seen by a physician which should be seen by a plastic surgeon;

C_c = proportion of episodes treated nonsurgically;

$N1_c$ = number of annual visits per episode of c for these patients;.

f_1 = proportion of total visit workload represented by the explicitly considered conditions = .90; and

$\Sigma_c(I_c \cdot A_c \cdot B_c \cdot C_c \cdot N1_c) = 1613$ visits per 100,000.

Table III.I.2

CONDITIONS ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 PLASTIC SURGERY WORKLOAD

ICDA	Condition	Percent of Workload
173	Other malignant neoplasm of skin	4.7
701.3,	Keloid scar	3.9
701.9,	Other hypertrophic and atrophic conditions of skin	
709	Other diseases of skin	
	TOTAL	8.6%

The time required to perform the procedure included not merely skin-to-skin time in the operating room, but also time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement for a given procedure per 100,000 population is simply the product of these factors, which is calculated by multiplying the procedure rate by the proportion to be done by plastic surgeons, and that by the time required to perform the procedure.

In addition to the time required for the performance of the surgical procedure, surgical norms of care included associated inpatient and office visits per episode. For each procedure the Panel estimated the total number of associated inpatient and office visits that would be required for the surgical patient. These were aggregated across all procedures, as were surgery times, in order to establish the total service requirements. Again, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by plastic surgeons was explicitly listed on the surgery care list. These calculations are summarized in Table III.I.3.

Table III.I.3.

SERVICE REQUIREMENTS FOR PLASTIC SURGEONS FOR SURGICAL CARE

A. Surgical Component

$$S_{2A} = \sum_p (F_p \cdot G_p \cdot H_p) \cdot 2435/f_2 = 2,968,181 \text{ hours:}$$

where

S_{2A} = service requirements;

F_p = surgery rate (per 100,000) for procedure p;

G_p = proportion of these procedures which should be performed by plastic surgeons;

H_p = door-to-door procedure time for procedure p;

f_2 = proportion of surgical workload represented by the explicitly considered procedures = .87; and

$\sum_p (F_p \cdot G_p \cdot H_p)$ = 1060.5 hours per 100,000.

B. Visits Component

$$S_{2B} = \sum_p (F_p \cdot G_p \cdot I_p) \cdot 2435/f_2 = 11,424,908 \text{ visits:}$$

where

S_{2B} = service requirements;

I_p = inpatient visits per episode of p; and

$\sum_p (F_p \cdot G_p \cdot I_p)$ = 4082.0 visits per 100,000.

The list of procedures which contributed significantly to the plastic surgery manpower requirements are shown in Table III.I.4.

Table III.I.4

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 PLASTIC SURGERY WORKLOAD

ICDA	Procedure	Percent of Workload
92.5	Suture of skin or mucous membrane	12.2
19.3	Rhinoplasty and repair of nose	11.0
07.4	Blepharoplasty	6.1
92.1	Local excision of lesion of skin and subcutaneous tissue	6.1
94.3	Facial rhytidectomy (face lifting)	6.1
94.4	Augmentation mammoplasty other than post-mastectomy	4.2
93.2, 93.3	Free skin graft to hand Free skin graft to other sites	4.2
---	Maxillofacial trauma repair (from ICDAs 97 and 98)	3.6
92.2	Wide or radical excision of lesion of skin	3.1
	TOTAL	56.6%

The Practice Profile

In order to convert the service requirements into manpower requirements, it is necessary to have an estimate of the 1990 productivity of the average plastic surgeon. These estimates were derived from Panel estimates of a "typical practice profile," a description of the annual practice of plastic surgeons. Table III.I.5 shows the productivity estimates derived from the profile.

By dividing by the appropriate productivity factor, service requirements in each of the two categories discussed above were translated into requirements for full-time equivalent plastic surgeons. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required head count: that was, to adjust for plastic surgeons who would be required to perform nonpatient care tasks such as teaching, research, and administration. The Panel also estimated this factor and it was used to inflate the full-time equivalents to the required head count of plastic surgeons in 1990. Details of the calculations are presented in Table III.I.6. The number of plastic surgeons required in 1990 according to the Delphi Panel was 3,113.

Table III.I.5

THE EXPECTED 1990 PRACTICE PROFILE OF PLASTIC SURGEONS
PRODUCTIVITY ESTIMATES

A. Annual hours worked:

47 (46-48)	Annual weeks worked
x 46 (43-50)	Weekly hours worked
2162	Annual hours worked = P_1

B. Annual full-time equivalent (FTE) office visits productivity:

2162	Annual hours worked
x 6 (4-8)	Office visits per hour
12972	Office visits per FTE year

C. Annual FTE inpatient visits productivity:

2162	Annual hours worked
x 4 (4-10)	Inpatient visits per hour
8648	Inpatient visits per FTE year

D. Annual FTE visits (inpatient and office) productivity:

This requires a weighted average using the medians from B and C above with the estimate from "proportion of all visits which are conducted in office" (80% (75%-80%)) as the weight: (6x.80) + (4x.20) = 5.6 visits per hour.

2162	Annual hours worked
x 5.6	Visits per hour
12107.2	Visits per FTE year = P_2

E. Percent of time in "other professional time," i.e., not in office or hospital delivering care: 14% (8.0-21.7%)

Table III.I.6

FINAL REQUIREMENTS FOR PLASTIC SURGEONS

$$N = \left(\frac{S_1 + S_{2B}}{P_2} + \frac{S_{2A}}{P_1}\right)/(1-f_3) = 3113:$$

where

N = head count of required plastic surgeons; and

f_3 = proportion of all plastic surgeons' time in nonpatient care activities = .140

3. Modeling Panel Review of Plastic Surgery Delphi Panel Estimates

After reviewing the output of the Plastic Surgery Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.I.7.

The net effect of the Modeling Panel's changes was to reduce the estimated requirements for plastic surgeons from 3,113 to 2,549. The Committee essentially accepted this estimate, with the exception of a concern that mean procedure time for sutures of skin (ICDA 92.5) had been reduced too much by the Modeling Panel. The Committee's recommendation for the number of plastic surgeons required in 1990 is 2,550 to 2,800.

Table III.I.7

MODELING PANEL RECOMMENDATIONS CONCERNING PLASTIC SURGERY PANEL ESTIMATES

	Recommendation	Net Change in Number of Plastic Surgeons Required
1.	Increase rate for ICDA procedure 04 group, operations on peripheral nerves, from 82 to 100, and increase share from 7.5 to 15%	+48
2.	Reduce rate of 19.3, rhinoplasty, from 135 to 120	-39
3.	Reduce rate of 19.4, reduction of nasal fractures, from 60 to 30	-20
4.	Reduce share of 25.2, radical excision of lymphatic structure, from 12.5 to 10%	-5
5.	Reduce rate of 65.2, partial mastectomy, from 180 to 91	-36
6.	Reduce share of 65.7, repair or plastic operations on breast (post-mastectomy) from 100 to 70%	-26
7.	Increase rate of 89.1-89.3, hand procedures, from 37 to 40	+5
8.	Reduce rate of 92.1, local excision of skin, from 1000 to 500, and increase share from 10 to 20%	0
9.	Reduce share of 92.2, wide or radical excision of skin, from 50 to 40%	-18
10.	Reduce rate of 92.5, suture of skin, from 3000 to 250, increase share from 2.5 to 10%, and reduce time required from 2.0 to 1 hour	-255
11.	Reduce share of 94.3, rhytidectomy, from 92.5 to 90%	-4
12.	Reduce rate of 95.1, excision of salivary glands, from 16 to 15	-3
13.	Reduce rate of augmentation mammoplasty from 26 to 16	-52

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Table III.1.7 (Continued)

Recommendation	Net Change in Number of Plastic Surgeons Required
14. Reduce rate of ICDA 173, other malignant neoplasm of skin, from 3000 to 1000	-99
15. Reduce rate of 701.3, 701.9, 709, keloid scar and skin conditions, from 2000 to 1000	-60
TOTAL	-564

J. THORACIC SURGERY

1. Overview

The Thoracic Surgery Delphi Panel noted that the appropriate surgeon provider for the treatment of some vascular conditions was an unresolved issue, since approximately half of thoracic surgery training programs include training in vascular surgery. With respect to occlusion of precerebral arteries and carotid endarterectomy, for example, the surgery is also done by vascular surgeons and neurosurgeons. The choice currently depends largely on local referral patterns and may change over the next ten years. Intra-abdominal endarterectomies are often performed by thoracic surgeons since the procedure includes angioplasty.

The Panel estimated 1990 surgery rates for several procedures which indicated that the increasing rates of the past decade will level off or decline. Three of these are displayed in Table III.J.1.

Cardiac revascularization was discussed at length. It was anticipated that the increase in coronary artery by-pass grafts would encompass a decrease in rates of single-vessel grafts and simultaneous growth in rates of triple-vessel grafts. Changes in prevalence of rheumatic heart disease as well as the technology of prosthetic materials would lead to reduction in rates of operations on valves. Rates of operations to insert or replace pacemakers will be less frequent because of the changes in the electronic technology as well as the strategies of therapy.

Table III.J.1

TRENDS IN RATES FOR SELECTED THORACIC PROCEDURES

ICDA	Procedure	Rates per 100,000 population 1971	1975	1977	1990
29.8	Cardiac revascularization	--	27	38	44
29.2	Operations on valve of heart without tissue or inert graft				
29.4	Operations on valve of heart with inert material	8	11	15	13.5
30.4	Insertion of electronic heart device				
30.5	Replacement of electronic heart device	--	46	63	51

The Panel felt that the principal opportunity for delegation with respect to the delegation of work to nonphysician providers, was in the area of operating room assistance, rather than in inpatient or office care. The Panel took such operating room assistants into account in its estimates.

Finally, it should be noted that the Thoracic Surgery Panel estimated a 1990 workweek of 54 hours, a length which matches the estimate for neurosurgeons, and is greatest among the surgical specialties. For a detailed documentation of the Thoracic Surgery Delphi Panel, see Wills and Garrison, 1980.

2. Documentation of Manpower Requirements Calculation

Manpower requirements in thoracic surgery were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of thoracic surgeons. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each service category. The sum of FTEs across service categories was then inflated to account for requirements for thoracic surgeons to perform non-patient care tasks such as teaching, research, and administration.

Each step in the calculation is documented in detail.

Service Requirements--The Thoracic Surgery Delphi Panel estimated service requirements in three categories, as follows:

- Inpatient visits to nonsurgical, hospitalized patients;
- Surgical care, including both the performance of the procedure and associated inpatient and office visits; and
- Office visits to nonsurgical patients.

Inpatient Visits to Nonsurgical Patients--Service requirements for inpatient visits to nonsurgical patients were estimated by the Panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the 1990 nonsurgical hospital admission rate (per 100,000 population) for the disease or condition was estimated by the Panel. Background data from the Hospital Discharge Survey was used in making these estimates. This number was then multiplied by the proportion of these individuals who should be seen by a thoracic surgeon in 1990. Then, given the group of patients who should be seen by a thoracic surgeon in 1990, the Panel established for each patient with this condition a norm of care, measured as the average required inpatient visits per episode of the condition per year. Multiplying this norm by the number of individuals in the group yields the service requirements for inpatient visits per 100,000 population for this condition.

The total requirement is the sum of these inpatient visit rates across all conditions and multiplied by 2435, since the 1990 Series II

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Census Projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by thoracic surgeons. This was based on the Panel's estimate of the relative size of a residual category which included those other conditions not on the list but yet part of the overall workload. The service requirements for nonsurgical, hospitalized patients are summarized in Table III.J.2.

Table III.J.2

SERVICE REQUIREMENTS FOR THORACIC SURGEONS FOR NONSURGICAL, HOSPITALIZED PATIENTS

$$S_1 = \sum_c (D_c \cdot E_c \cdot N2_c) \cdot 2435/f_1 = 437{,}018 \text{ inpatient visits:}$$

where

S_1 = service requirements;

D_c = nonsurgical admission rate in 1990 for condition c;

E_c = proportion of these patients who should be treated by a thoracic surgeon;

$N2_c$ = annual inpatient visits per episode of c for these patients;

f_1 = proportion of total nonsurgical workload represented by the explicitly considered consitions = .95; and

$\sum_c (D_c \cdot E_c \cdot N2_c) = 170.5$ visits per 100,000.

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the 1990 rate (per 100,000 population) at which the surgical procedure should be performed, the proportion of these which should be done by a thoracic surgeon, and the average time per procedure. The time required was estimated for both the primary surgeon and, where required, for an assisting surgeon.

The time required to perform the procedure included not merely skin-to-skin time in the operating room but also time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement for a given procedure per 100,000 population is simply the product of these factors: the procedure rate; the proportion to be done by thoracic surgeons; and the time required to perform the procedure, for both primary and assisting surgeon.

In addition to the time required for the performance of the surgical procedure, surgical norms of care included associated inpatient and office visits per episode. For each procedure the Panel estimated the total number of associated inpatient and office visits that would be required for the surgical patient. These were aggregated across all procedures, as were surgery times, in order to establish the total service requirements. Again, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by thoracic surgeons was explicitly listed on the surgery care list. These calculations are summarized in Table III.J.3.

The surgical procedures which accounted for a significant portion of the thoracic surgery workload are shown in Table III.J.4.

Office Visits to Nonsurgical Patients--Office visits to nonsurgical patients comprise only a small proportion of the thoracic surgery workload. Hence, the Panel elected to treat these service requirements as a residual category, rather than estimating them on a condition-by-condition basis. The Panel estimated that office visits to nonsurgical patients accounted for 15 percent of all office visits. Since the Panel had separately estimated the number of office visits required by surgical patients, requirements for nonsurgical patients could be obtained simply. The calculation is displayed in Table III.J.5.

Given that the Thoracic Surgery Delphi Panel treated office visits as a residual category, estimated nonsurgical inpatient visits based on hospital admission rates, and estimated the surgery workload on a procedure-by-procedure basis, it was not necessary for the Panel to estimate condition-specific morbidity rates or the proportion of all episodes which should be seen by a physician. The manpower requirements estimates for thoracic surgery can be generated without recourse to these particular parameters. Nonetheless, the Panel did estimate these two parameters for each of a list of conditions, in order to provide a point of comparison to other specialty panels.

The Practice Profile--In order to convert the service requirements into manpower requirements, it is necessary to have an estimate of the 1990 productivity of the average thoracic surgeon. These estimates were derived from Panel estimates of a "typical practice profile," a description of the average annual practice of thoracic surgeons. Table III.J.6 shows the productivity estimates derived from the practice profile.

By dividing by the appropriate productivity factor, service requirements in each of the three categories discussed above were translated into requirements for full-time equivalent thoracic surgeons. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required head count: that was, to adjust for thoracic surgeons who would be required to perform non-patient care tasks such as teaching, research, and administration. The Panel also estimated this factor and it was used to inflate the full-time equivalents to the required head count of thoracic surgeons in 1990. Details of the calculations are presented in Table III.J.7.

Table III.J.3

SERVICE REQUIREMENTS FOR THORACIC SURGEONS FOR SURGICAL CARE

A. Surgical Component

$$S_{2A} = \sum_{p}(F_p \cdot G_p \cdot H_p) \cdot 2435/f_2 = 1{,}804{,}463 \text{ hours:}$$

where

S_{2A} = service requirements;

F_p = surgery rate (per 100,000) for procedure p;

G_p = proportion of these procedures which should be performed by thoracic surgeons;

H_p = door-to-door procedure time for procedure p (both primary and assist);

f_2 = proportion of surgical workload represented by the explicitly considered procedures = .95; and

$\sum_{p}(F_p \cdot G_p \cdot H_p) = 704.0$ hours per 100,000

B. Inpatient Visits Component

$$S_{2B} = \sum_{p}(F_p \cdot G_p \cdot I_p) \cdot 2435/f_2 = 4{,}305{,}080 \text{ inpatient visits:}$$

where

S_{2B} = service requirements;

I_p = inpatient visits per episode of p; and

$\sum_{p}(F_p \cdot G_p \cdot I_p) = 1679.6$ visits per 100,000

C. Office Visits Component

$$S_{2C} = \sum_{p}(F_p \cdot G_p \cdot J_p) \cdot 2435/f_2 = 1{,}180{,}334 \text{ office visits:}$$

where

S_{2C} = service requirements;

J_p = office visits per episode of p; and

$\sum_{p}(F_p \cdot G_p \cdot J_p) = 460.5$ visits per 100,000

Table III.J.4

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 THORACIC SURGERY WORKLOAD

ICDA	Procedure	Percent of Workload
29.8	Cardiac revascularization	35.2
29.4	Operations on valves of heart with inert material	8.4
30.4	Insertion of electronic device, heart	7.4
34.3	Lobectomy	5.4
27.5	Reconstruction of intra-abdominal arteries by blood vessel graft	4.8
24.7	Reconstruction of peripheral artery by blood vessel graft	4.3
	TOTAL	65.5%

Table III.J.5

SERVICE REQUIREMENTS FOR THORACIC SURGEONS FOR OFFICE VISITS TO NONSURGICAL PATIENTS

$$S_3 = S_{2C} \cdot \frac{f_3}{1-f_3} = 208{,}294 \text{ office visits:}$$

where

S_3 = service requirements;

S_{2C} = service requirements for office visits to surgical patients; and

f_3 = proportion of all office visits which are to nonsurgical patients = .15

Table III.J.6

THE ESTIMATED 1990 PRACTICE PROFILE OF THORACIC SURGEONS PRODUCTIVITY ESTIMATES

A. Annual hours worked:

47.0	(47-47)	Annual weeks worked
x 54.0	(54-73)	Weekly hours worked
2538.0		Annual hours worked = P_1

B. Annual full-time equivalent (FTE) office visits productivity:

2538.0		Annual hours worked
x 1.7	(1.2-2.2)	Office visits per hour
4314.6		Office visits per FTE year = P_2

C. Annual FTE inpatient visits productivity:

2538.0		Annual hours worked
x 4.1	(3.4-5.7)	Inpatient visits per hour
10405.8		Inpatient visits per FTE year = P_3

D. Percent of time in "other professional time," i.e., not in office or hospital delivering care: 16.4% (13.7-22.2%)

Table III.J.7

FINAL REQUIREMENTS FOR THORACIC SURGEONS

$$N = \left(\frac{S_1 + S_{2B}}{P_3} + \frac{S_{2C} + S_3}{P_2} + \frac{S_{2A}}{P_1}\right)/(1-f_4) = 1781:$$

where

N = head count of required thoracic surgeons; and

f_4 = proportion of all thoracic surgeons' time in non-patient care activities = .164

3. Modeling Panel Review of Thoracic Surgery Delphi Panel Estimates

After reviewing the output of the Thoracic Surgery Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.J.8.

The net effect of the Modeling Panel's changes was to increase the estimated requirements for thoracic surgeons from 1,781 to 1,942. After comparison to current manpower levels, the Committee felt that some further increase was desirable, and recommended 1990 manpower needs at 2,000-2,100. The main reason for this increase was to assure that thoracic surgeons would be accessible in medium size community areas. In order to accomplish this, some thoracic surgeons would spend some of their time in general surgery and general consultation work.

Table III.J.8

MODELING PANEL RECOMMENDATIONS CONCERNING
THORACIC SURGERY PANEL ESTIMATES

	Recommendation	Net Change in Number of Thoracic Surgeons Required
1.	Increase rate of ICDA procedure A4.4, esophogoscopy and gastroscopy, from 139 to 140	0
2.	Increase rate of 24.1, peripheral endarterectomy, from 5 to 7, and reduce share from 50 to 30%	-2
3.	Increase rate of 24.7, graft reconstruction of peripheral artery, from 20 to 25, and reduce share from 50 to 30%	-19
4.	Increase rate of 27.3, repair of abdominal aortic aneurysm, from 11 to 12, and reduce share from 50 to 25%	-23
5.	Increase rate of 27.5, reconstruction of intra-abdominal arteries, from 17 to 20, and reduce share from 50 to 25%	-33
6.	Increase rate of 30.4, insertion of pacemaker from 41 to 45	+15
7.	Increase rate of 34.2-.4, lung procedures, from 18 to 19, and reduce share from 100 to 95%	0
8.	Reduce workweek from 54 to 48 hours	+223
	TOTAL	+161

K. UROLOGY

1. Overview

The Urology Delphi Panel, along with the other surgical Panels, was careful to note that the efficiency with which operating suites are administered was a principal determinant of their productivity. Estimated procedure times reflect the time required to perform a procedure in isolation, but assuming no delays due to scheduling problems. This may overestimate time required if in fact several surgical procedures are performed consecutively, or underestimate it if unexpected delays are common.

A large component of the surgical service requirements for urologists is for prostatic conditions. The Panel noted that malignant neoplasms of the prostrate should be seen by an oncologist in addition to the urologist, but not in lieu of a urologist. The estimates reflect this pattern of treatment. For a detailed documentation of the Urology Delphi Panel estimate, see Wills and Garrison, 1980.

2. Documentation of Manpower Requirements Calculation

Manpower requirements in urology were calculated by dividing the total service requirements for visits and surgical care by appropriate productivity estimates, derived from a projected 1990 practice profile of urologists. This quotient is the number of full-time equivalent (FTE) surgeons required to provide patient care in each of three service categories. The sum of FTEs across service categories was then inflated to account for requirements for urologists to perform nonpatient care tasks such as teaching, research, and administration.

Each step in the calculation is documented in detail.

Service Requirements--The Urology Delphi Panel estimated service requirements in three categories, as follows:

- Office visits to nonsurgical patients;
- Inpatient visits to nonsurgical, hospitalized patients; and
- Surgical care, including both the performance of the procedure and the associated inpatient and office visits.

Nonsurgical Patients--Service requirements for nonsurgical patients were estimated by the panel on a condition-by-condition basis. The service requirements were calculated as follows: For each condition, the incidence or prevalence rate (per 100,000 population) for the disease or condition was multiplied by the proportion of individuals with that condition who should be seen by a physician in 1990; this product was then multiplied by the proportion of those individuals who should be seen by a urologist. The proportion who should see a physician are those who should see a physician in a given year. Thus, for example, even if all individuals with a certain chronic condition should at some time or another see a physician, if once diagnosed they need to see a physician only every other year, then the proportion who should see a physician in 1990 is 50 percent.

Then, given the group of patients who should see a urologist in 1990, the Panel established, for each patient with this condition, a norm of care, measured as the average required office visits per episode of the condition per year. Multiplying this norm by the number of individuals falling into the nonsurgical group yields the total service requirements for visits per 100,000 population for this condition.

The total requirements were calculated by aggregating this number across all conditions and multiplying by 2,435, since the 1990 Series II Census Projection for the U.S. population is 243,500,000. A final adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of all conditions treated by urologists. This was based on the Panel's estimate of the relative size of a residual category which included those conditions not on the list but yet part of the overall workload. The service requirements for nonsurgical patients are summarized in Table III.K.1.

Table III.K.1

SERVICE REQUIREMENTS FOR UROLOGISTS FOR NONSURGICAL PATIENTS

$S_1 = \sum_c (I_c \cdot A_c \cdot B_c \cdot N1_c) \cdot 2435/f_1 = 16{,}770{,}996$ office visits:

where

S_1 = service requirements;

I_c = morbidity rate (per 100,000) of condition c;

A_c = proportion of episodes of c which should be seen by a physician;

B_c = proportion of episodes seen by a physician which should be seen by a urologist;

$N1_c$ = number of annual office visits per episode of c for these patients;

f_1 = proportion of total office visit workload represented by the explicitly considered conditions = .91; and

$\sum_c (I_c \cdot A_c \cdot B_c \cdot N1_c) = 6267.6$ visits per 100,000.

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Nonsurgical, Hospitalized Patients--Service requirements for nonsurgical, hospitalized patients were established as follows: For each condition the estimated 1990 nonsurgical hospital admission rate was estimated. Background data on nonsurgical admissions from the Hospital Discharge Survey were used by the Panel in this process.

Once the nonsurgical admission rate had been established, the proportion of these admissions which should be seen by a urologist was estimated. The Panel then estimated the norms of care for these patients in terms of the number of inpatient visits required per episode of the condition.

Summing the required visits for each condition for this category of patients across all conditions yields the total service requirements. Again, an adjustment was made to account for the fact that the list of conditions considered by the Panel was not exhaustive of every condition urologists treat. The service requirements for nonsurgical, hospitalized patients are summarized in Table III.K.2.

Table III.K.2

SERVICE REQUIREMENTS FOR UROLOGISTS FOR
NONSURGICAL, HOSPITALIZED PATIENTS

$$S_2 = \sum_c (D_c \cdot E_c \cdot N2_c) \cdot 2435/f_2 = 2{,}331{,}918 \text{ inpatient visits:}$$

where

$S2$ = service requirements;

D_c = nonsurgical admission rate in 1990 for condition c;

E_c = proportion of these patients who should be treated by a urologist;

$N2_c$ = annual inpatient visits per episode of c for these patients;

f_2 = proportion of total inpatient visit workload represented by the conditions = .90; and

$\sum_c (D_c \cdot E_c \cdot N2_c)$ = 861.9 visits per 100,000.

The conditions which accounted for a significant portion of the urology workload are shown in Table III.K.3.

Table III.K.3

CONDITIONS ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 UROLOGY WORKLOAD

ICDA	Condition	Percent of Workload
592	Calculus of kidney and ureter	5.4
595	Cystitis	4.8
185	Malignant neoplasm of prostate	4.7
600	Hyperplasia of prostate	3.9
601 602	Prostatitis, and Other diseases of prostate	3.4
188	Malignant neoplasm of bladder	3.4
	TOTAL	25.6%

Surgical Patients--Service requirements for surgical care were estimated on a procedure-by-procedure basis, unlike service requirements for nonsurgical patients, which were estimated on a condition-by-condition basis. For each procedure the Panel estimated the following parameters: the 1990 rate (per 100,000 population) at which the surgical procedure should be performed, the proportion of these cases which should be done by a urologist, and the average time per procedure.

The time required to perform the procedure included not merely skin-to-skin time in the operating room, but also time for scrubbing, preparation, anesthesia induction, dictating, and writing postoperative orders. The total time requirement per 100,000 population is simply the product of these factors, and is calculated by multiplying the procedure rate by the proportion to be done by urologists by the time required to perform the procedure.

In addition, two further adjustments were made. First, for each procedure, the Panel estimated the proportion of times it was performed as a secondary rather than the primary procedure. In these cases giving the procedure the time required as a primary procedure would lead to an overestimate of true requirements. The Panel, therefore, adopted the convention of giving it one half the time that would have been required had it been performed as the primary procedure. Also, no additional visits were attached to secondary procedures, and this has also been factored into the requirements calculation.

The second adjustment concerns assistant surgeons. For some procedures the Panel felt that an assisting urologist was required at the operating table. They estimated the additional requirements in these cases. The variable H_p in Table III.K.4 includes both primary and assistant surgeon time requirements.

In addition to the time required for the performance of the surgical procedure, surgical norms of care included associated inpatient and office visits per episode. For each procedure the Panel estimated the total number of associated inpatient and office visits that would be required for the surgical patient. These were aggregated across all conditions, as were surgery times, in order to estimate the total service requirements. Again, the Panel estimated the relative size of a residual category to account for the fact that not every surgical procedure performed by urologists was explicitly listed on the surgery care list. These calculations are summarized in Table III.K.4.

The procedures which contributed a significant portion of the urology workload are shown in Table III.K.5.

The Practice Profile--In order to convert the service requirements into manpower requirements it is necessary to have an estimate of the 1990 productivity of the average urologist. These estimates were derived from Panel estimates of a "typical practice profile," a description of the average annual practice of urologists. Table III.K.6 shows the productivity estimates derived from the practice profile.

Table III.K.4

SERVICE REQUIREMENTS FOR UROLOGISTS FOR SURGICAL CARE

A. Surgical Component

$$S_{3A} = \sum_p (F_p \cdot G_p \cdot H_p) \cdot 2435/f_3 = 3{,}624{,}092 \text{ hours:}$$

where

S_{3A} = service requirements;

F_p = surgery rate (per 100,000) for procedure p;

G_p = proportion of these procedures which should be performed by urologists;

H_p = door-to-door procedure time for procedure p, both primary and assisting urologist if appropriate;

f_3 = proportion of surgical workload represented by the explicitly considered procedures = .90; and

$\sum_p (F_p \cdot G_p \cdot H_p) = 1339.5$ hours per 100,000

B. Inpatient Visits Component

$$S_{3B} = \sum_p (F_p \cdot G_p \cdot I_p) \cdot 2435/f_3 = 8{,}182{,}682 \text{ inpatient visits:}$$

where

S_{3B} = service requirements;

I_p = inpatient visits per episode of p; and

$\sum_p (F_p \cdot G_p \cdot I_p) = 3024.4$ visits per 100,000.

C. Office Visits Component

$$S_{3C} = \sum_p (F_p \cdot G_p \cdot J_p) \cdot 2435/f_3 = 8{,}324{,}183 \text{ office visits:}$$

where

S_{3C} = service requirements;

J_p = office visits per episode of p; and

$\sum_p (F_p \cdot G_p \cdot J_p) = 3076.7$ visits per 100,000.

Table III.K.5

PROCEDURES ACCOUNTING FOR THREE PERCENT OR MORE OF THE 1990 UROLOGY WORKLOAD

ICDA	Procedure	Percent of Workload
A4.6	Cystoscopy and urethroscopy without effect upon tissue or lesion	11.4
58.2	Prostatectomy, transurethral	9.7
57.4	Repair and plastic operations on urethra	3.9
54.5	Nephrectomy, complete	3.6
	TOTAL	28.6%

Table III.K.6

THE PRACTICE PROFILE OF UROLOGISTS PRODUCTIVITY ESTIMATES

A. Annual hours worked:

46	(44-48)	Annual weeks worked
x 48	(45-60)	Weekly hours worked
2208		Annual hours worked = P_3

B. Annual full-time equivalent (FTE) office visits productivity:

2208		Annual hours worked
x 2.85	(2.5-4.0)	Office visits per hour
6292.8		Office visits per FTE year = P_1

C. Annual FTE inpatient visits productivity:

2208		Annual hours worked
x 3.2	(2.4-4.2)	Inpatient visits per hour
7065.6		Inpatient visits per FTE year = P_2

D. Percent of time in "other professional time," i.e., not in office or hospital delivering care: 15.1% (10.0%-25.0%)

By dividing by the appropriate productivity factor, service requirements in each of the three categories discussed above were translated into requirements for full-time equivalent urologists. One final adjustment was necessary to convert the sum of these full-time equivalents into a total required head count: that was, to adjust for urologists who would be required to perform nonpatient care tasks such as teaching, research, and administration. The Panel also estimated this factor and it was used to inflate the full-time equivalents to the required head count of urologists in 1990. Details of the calculations are presented in Table III.K.7. According to the Urology Delphi Panel, 8,383 urologists will be required in 1990.

Table III.K.7

FINAL REQUIREMENTS FOR UROLOGISTS

$$N = \left(\frac{S_1 + S_{3C}}{P_1} + \frac{S_2 + S_{3B}}{P_2} + \frac{S_{3A}}{P_3}\right)/(1-f_4) = 8383:$$

where

$N =$ head count of required urologists; and

$f_3 =$ average proportion of all urologists' time in nonpatient care activities = .151

3. Modeling Panel Review of Urology Delphi Panel Estimates

After reviewing the output of the Urology Panel, the Modeling Panel made a series of recommendations concerning the estimates. These are shown in Table III.K.8.

The net effect of the Modeling Panel's recommendations was to reduce the estimated requirements for urologists from 8,383 to approximately 7,900. The Committee's recommendation for the number of urologists required in 1990 is 7,500-7,800.

Table III.K.8

MODELING PANEL RECOMMENDATIONS CONCERNING UROLOGY PANEL ESTIMATES

	Recommendation			Net Change in Number of Urologists Required
1.	Reduce share of ICDA procedure 38.2: hernia repair from 1 to 0%			-2
2.	Increase rate of 54.5: nephrectomy, from 17 to 18, and reduce share from 90 to 80%			-11
3.	Reduce share of 59.7: orchiopexy, from 75 to 60%			-14
4.	Reduce estimated morbidity rates for the following conditions:			
	ICDA	Delphi Panel Estimate	Modeling Panel Revision	
	753.0, .1, .3, .5, .7: selected congenital anomalies of urinary system	200	100:	
	597: urethritis (nonvenereal)	146	100	
	599: other urinary tract diseases	600	300	
	786.0: .1, .3, .5, .7: selected systems referrable to genitourinary system	240	120	
5.	Reduce percent to see physician for 595: Cystitis, from 95% to 75%			
6.	Increase percent to see urologist for 456.1: Scrotal varicocele, from 25% to 60%			
7.	Reduce office visits per episode of 592: Calculus of kidney and ureter, from 4 to 3			-236
8.	Reduce office visits per procedure associated with the following procedure:			
	ICDA	Delphi Panel Estimate	Modeling Panel Estimate	
	58.2: Prostatectomy, transurethral	6	4.5	
	57.4: Repair of urethra	9	6	
9.	Reduce inpatient visits per episode associated with the following procedures:			
	ICDA	Delphi Panel Estimate	Modeling Panel Estimate	
	56.3: Cystectomy	30	20	
	56.8: Removal of calculus	10	6	
	59.7: Orchiopexy	10	6	-172
	TOTAL			-435

L. OBSTETRICS/GYNECOLOGY

1. Overview

Obstetrics-Gynecology (OB/GYN) is a medical field which primarily focuses upon the provision of delivery, family planning, and gynecological services for women 15 through 44 years of age. According to 1975 data from the National Ambulatory Medical Care Survey (NAMCS), approximately 85 percent of all ambulatory visits for women 15 thru 44 years of age were provided in the OB/GYN office (National Center for Health Statistics, March 13, 1978). Nearly one half of the practice of OB/GYN specialists is devoted to deliveries (Krasner, 1974) and 65 percent of family planning services take place in the office of OB/GYN specialists (National Center for Health Statistics, April 16, 1979). Consequently, the majority of the visits to the OB/GYN specialists are not considered to be serious. Seventy-five percent of problems in the ambulatory component of OB/GYN care are rated by the physician to be nonsevere and of a "nonpathologic identity," since they focus upon examinations without illness, observations without further need of care and special conditions (Koch and Dennison, April 1978). This is evidenced in the distribution of the major conditions in the ambulatory practice of OB/GYN specialists listed.

Type of Visit	Percentage of Ambulatory Practice
Pregnancy	33.1
Gynecologic Exam	15.8
Vaginal Discharge	6.1
Surgical Aftercare	5.8
Menstruation	5.5
Abdominal Pains	3.2
Total	69.5

(Taken from 1975 data of the National Ambulatory Medical Care Survey (NAMCS) published by the National Center for Health Statistics, March 13, 1978).

The University of California report on the practice of OB/GYN specialists reflects the following distribution of the practice of OB/GYN specialists. As in the case of the NAMCS data, the conditions are basically nonsevere in nature (Mendenhall, September 23, 1977).

Concerning the ambulatory component of the OB/GYN practice, one of the important issues surrounding the OB/GYN specialty is the degree to which it focuses upon nongynecologic primary care. The American College of Obstetricians and Gynecologists (ACOG) has been recommending since the early 1970s that OB/GYN be considered a primary care specialty. One study undertaken in Michigan demonstrated that 44 percent of patients in 50 practices of OB/GYN specialists did not have another primary care physician. Furthermore, 86 percent of the patients saw the OB/GYN

Conditions	% Seen in Solo Practice	% Seen in Partnership	% Seen in Group Practice
Prenatal Care	26.4	26.9	24.9
Medical Exam	18.8	19.0	18.4
Medical and Surgical Aftercare	7.4	7.8	7.7
Postpartum Observation	5.9	9.2	7.8
Menstrual Disorder	4.6	4.8	5.0
Infectious Disease of uterus, vagina, vulva	2.7	2.6	3.0
Delivery without complications	2.1	1.7	1.9
Abortion, medically induced	0.8	0.6	1.0
Total % of all encounters	68.8	72.5	69.6

specialist for regular periodic examinations and 69 percent of them, on a regular or occasional basis, consulted an OB/GYN specialist for nongynecologic conditions (Burkens and Wilson, 1975). Evidence such as this, combined with the above-mentioned fact that over 80 percent of ambulatory visits for women between the ages of 15 and 44 occur in the OB/GYN office, has been utilized as support for designating OB/GYN as a primary care specialty. However, since some OB/GYN specialists confine their examinations to bimanual and speculum examinations in addition to cytology screening, the question has been raised as to whether or not the entire field is equiped to provide nongynecologic primary care (Steering Committee for Cooperative Teaching, Association of Professors of Gynecology and Obstetrics, 1975). The decision by ACOG to reinstate a "foundation" year prior to a 3-year residency in OB/GYN was designed to help resolve the above problem by better preparing OB/GYN specialists in the provision of primary care.

The largest portion of the OB/GYN specialist's professional time is devoted to the ambulatory component of care followed in magnitude by hospital gynecological and obstetrical work as is evidenced below:

Major Practice Locales/Types	Percentage of Professional Time
Hospital Obstetrics	23.0
Hospital Gynecology	24.0
Ambulatory Care	35.0

Subspecialization does take place in the field, but not to the extent that it does in internal medicine or even pediatrics. Approximately 2.8 percent of board diplomates in OB/GYN are subspecialists whereas 9.5 percent in pediatrics and 34.7 percent in internal medicine are. The largest number of subspecialists are in gynecologic oncology followed by maternal-fetal medicine and reproductive endocrinology. In 1976, 30.5 percent of residents planned to subspecialize, with the largest percentage expressing an interest in reproductive endocrinology. However, the largest number of subspecialists in training are in maternal-fetal health. At present there is an excess in the number of young OB/GYN specialists and residents who desire to subspecialize as compared to the number of fellowships available or the apparent demand for subspecialists, especially in gynecologic oncology. The ACOG study on Manpower Planning in OB/GYN states that few or no more subspecialists "should" be needed (Pearse, et al., 1977-1980).

Since the early 1970s, ACOG has been emphasizing the team approach in the provision of OB/GYN services. This team includes the cooperative role between the physician and nonphysician health providers working with the physician, such as nurse-midwives. Currently, there are 15,000 nurses involved in maternal, gynecologic and neonatal nursing. (Pearse; 1977-1979). In the mid 1970s, there were approximately 621 nurse-midwives in active clinical practice in the U.S.; these approximated one-half of all midwives. Currently, there are over 2,000 nurse-midwives. Each nurse-midwife in clincial practice averages over 68 deliveries per year and consequently, over 1 percent of all deliveries are performed by nurse-midwives.

In addition to the team concept, practice profiles of OB/GYN specialists have altered to the extent that there is a decreasing trend to solo practice among the younger physicians. Group practices are still more popular in the West (Mendenhall, et al., April 15, 1978). Physicians in nonmetropolitan areas tend to see more patients than those in metropolitan areas and practices in the North Central and Southern regions are generally the busiest.

2. Documentation of the Manpower Requirements Calculation

Service requirements for OB/GYN were estimated by a group of seven expert consultants. Included in the Panel were four obstetricians/gynecologists, one family practitioner, one nurse-midwife, and one consumer representative. Panelists met for three series of meetings, at which time they reviewed and adjusted recent reference data provided them to 1990.

Service requirements in OB/GYN were calculated separately for the following four groups: Ambulatory gynecologic care; hospital nonsurgical care, hospital surgical care and obstetric care. Ambulatory gynecologic and hospital nonsurgical requirements were calculated utilizing the basic GMENAC generic model. Hospital surgical and delivery services which are procedural were calculated differently. Originally, the California Relative Values (CRVs) for each procedure were used in place of visits to estimate norms of care, because of the high correlation between the CRV scale and effort expanded by a physician. However, upon comparing CRV units across procedures, concern was raised that the scale did not accurately differentiate procedures on the basis of time and service intensity. Consequently, Delphi panelists were asked to review the hospital discharge data for surgical procedures and estimate the amount of "door to door" (not "skin to skin")1/ time involved in performing each individual primary procedure, and the appropriate average number of inpatient and outpatient visits associated with each primary procedure. Moreover, panelists supplied their estimate on the percentage of time each surgery was performed as a secondary procedure. Appropriate time and visits required for secondary procedures were weighted by one-half the numbers allocated for the primary procedures.

Panelists estimated service requirements for OB/GYN by differentiating needs into the four types of care previously discussed: Ambulatory gynecologic care, hospital nonsurgical care, hospital surgical care and obstetric care. In the ambulatory and delivery components, the panelists estimated needs for the OB/GYN team, from which they separated that part which should totally accrue to the OB/GYN specialist.

Ambulatory Gynecologic Care--Separate service requirements for the OB/GYN team were calculated for the 28 major conditions in the office practices of the specialists. From these, the number of visits which could be performed by an appropriately trained nonphysician provider were subtracted, leaving a total of gynecologic services requiring the intervention of an OB/GYN specialist. Displayed in Table III.L.1 is the percentage distribution of the service requirements for major groups of conditions, as determined by the OB/GYN panelists:

Table III.L.1

CONDITION GROUPINGS OF MAJOR IMPACT ON OB/GYN SPECIALIST SERVICE REQUIREMENTS (DELPHI PANEL RESPONSES)

Condition Groupings	% of Ambulatory Gynecologic Practice
Infectious and Parasitic Diseases	13.1
Endocrine, Nutritional and Polyglandular Diseases	0.1
Neoplasms	3.0
Diseases of the Circulatory System	4.5
Diseases of the Genitourinary System	53.7
Complication of Pregnancy, Childbirth and Puerperium	5.3
Symptoms and Ill-Defined Conditions	2.4
Well Care	6.4
Family Planning	10.8
Sexual Counseling, Rape Management	0.7
Total	100.0

1/ "Door to door" time begins with entering the operating suite and leaving it. Unlike "skin to skin" time it includes time for scrub and preparation, anesthesia induction, and dictating and writing post operative orders.

Diseases of the genitourinary system have been projected to impact the most upon the practice of a full-time equivalent (FTE) in OB/GYN, comprising over 50 percent of his/her ambulatory gynecologic practice. The specific conditions which dominate this major category include chronic cystic breast disease, cervical dysplasia, infectious diseases of the uterus, vagina and vulva, disorders of menstruation and menopausal symptoms. The following diseases of the genitourinary system in order of magnitude are: Infectious and parasitic diseases, family planning; and well care.

Well care, panelists thought, should be made available on an annual basis to all women who have no morbidities within a given year. Approximately 37 percent of these women were estimated to require care by the OB/GYN team. Prior to subtraction for maximum potential delegation, well care was estimated to account for over 10 percent of the ambulatory gynecologic practice of the OB/GYN team. Since panelists felt that over 64 percent of well care should be performed by an appropriately trained nonphysician provider, the total impact of well care on the service requirements for the OB/GYN specialist diminishes to 6.4 percent of his/her practice.

Family planning, like well care, also was estimated to impact strongly upon requirements for the OB/GYN team, totaling approximately 15 percent of its gynecologic service requirements. However, since 60 percent of family planning services (pill, diaphragm and IUD) were delegated to the nonphysician component of the team, the impact of family planning services on the OB/GYN specialist declined to near 11 percent of his/her ambulatory gynecologic practice.

In total, the Delphi panelists estimated that a total of 55,317,708 visits to an OB/GYN specialist were required for the ambulatory gynecologic care of women. A correction factor for simultaneity of 1.3, obtained from the NAMCS, when applied to these visits reduces the service requirements to 42,552,159. In order to translate these service requirements into professional requirements, the visits need to be divided by the annual ambulatory productivity of the OB/GYN specialist. Originally panelists estimated that the average OB/GYN specialist provides 99 ambulatory visits a week in 13.2 hours, which he/she spends in ambulatory care. Panelists also estimated that the average practicing OB/GYN specialist spends 29.0 hours a week for 45.6 weeks per year in patient care activities. Thus, the productivity of an FTE OB/GYN specialist in ambulatory care totals 10,070 visits per year. Upon the advice of one panelist who felt that the ambulatory care productivity was too high, did not account for that portion of outpatient care which is surgical, and requires greater time involvement on the part of the OB/GYN specialist, the weekly FTE visits were decreased from approximately 220 visits to 200 visits, which concominantly decreases the FTE annual productivity to 9,120 visits. Dividing the service requirements for ambulatory gynecologic care by this factor yields a need for 4,666 OB/GYN specialists in 1990.

Delegation of Ambulatory Gynecologic Visits--The Delphi Panel in OB/GYN originally delegated 43 percent of the ambulatory gynecologic visits accruing to the OB/GYN team. The conditions with the greatest impact on this delegation are presented in Table III.L.2.

The largest percentage of the delegation occurs for diseases of the genitourinary system, infectious and parasitic diseases, family planning and well care. These four areas also have the major impact on the service requirements for OB/GYN specialists because of the high rates accruing to the specialty team.

As previously mentioned, family planning and well care delegation approximate 60 percent of all allocated visits for these groupings to the OB/GYN team. The percentage of delegated visits for genitourinary conditions was less than 50 percent of all visits to the team for these conditions. However, since the prevalence of these conditions is very high, they comprise the largest percentage of all delegated visits for gynecologic conditions. Panelists, it also should be noted, delegated over 80 percent of obesity and near 70 percent of colds accruing to their specialty. However, these conditions have a small impact on the practice of the OB/GYN team.

Table III.L.2

CONDITION GROUPINGS OF MAJOR IMPACT ON OB/GYN
DELEGATION FOR GYNECOLOGIC AMBULATORY CARE
(Delphi Panel Responses)

Condition Groupings	% of Ambulatory Gynecologic Delegation
Infectious and Parasitic Diseases	16.4
Endocrine, Nutritional and Polyglandular Diseases	0.5
Neoplasms	0.1
Diseases of the Circulatory System	7.9
Diseases of the Genitourinary System	35.7
Symptoms and Ill-Defined Conditions	1.3
Complications of Pregnancy, Childbirth and Puerperium	0.7
Well Care	15.9
Family Planning	21.1
Sexual Counseling, Rape Management	0.4
Total	100.0

Hospital Nonsurgical Care--Hospital nonsurgical care is of lesser importance in the practice of the OB/GYN specialist. Panelists estimated requirements for women with 10 major conditions which require hospitalization, but no surgery. The Delphi Panel felt that 100 percent of all these people should see the OB/GYN specialist in 1990 for an average of 1.75 visits per day, none of which should be delegated. The lengths of stay for these conditions ranged from 1.5 to 4.7 except for pelvic inflammatory disease and malignant neoplasms of the female genitourinary system which had respective lengths of stay of 6.4 days and 9.6 days. Among the conditions which required hospitalization but no surgery for some of the patients are: Chronic cystic breast disease; infectious diseases of the cervix and uterus; uterovaginal prolapse; intermenstrual bleeding and complications of pregnancy; and childbirth and puerperium. Since the discharge rate for all 10 conditions totals only 705.8 per 100,000 women, the impact on professional requirements for OB/GYN specialists remains slight, even though the Panel estimated that the OB/GYN specialist should provide care for all of these patients. Dividing the service requirements for these patients (a total of 4,996,334 visits) by the Panel's estimate of the annual productivity of a FTE OB/GYN specialist inolved in the provision of only hospital nonsurgical care (4,560 visits per year), equals a need for 1,096 FTE OB/GYN specialists to provide services for nonsurgical inpatients in 1990.

Hospital Surgical Requirements--As mentioned previously, a slightly different approach was utilized by the Delphi Panel in estimating surgical requirements for OB/GYN specialists in 1990. Visits as well as procedure time were incorporated in the estimation of surgical needs. For those services which are performed as secondary procedures, time and visit allocations were halved in the calculations. Table III.L.3 lists the procedures which have a major impact on the surgical requirements for OB/GYN specialists, as determined by the Delphi Panel.

Table III.L.3

SURGICAL SERVICE REQUIREMENTS OF THE OB/GYN SPECIALIST
(DELPHI PANEL RESPONSES)

Surgical Procedures	Percentage of all Surgical Service Requirements
Ligation and Division of Fallopian Tubes, Bilateral	21.6
Oophorectomy, Salpingoophorectmy	14.6
Hysterectomy	19.8
Dilation and Curretage, Diagnostic	6.4
Plastic Repair of Cystocoel, Rectocoel	3.9
Obstetrical Surgery, Excluding C-Sections	6.3
Other	27.4
Total	100.0

Nearly 50 percent of all surgical requirements for OB/GYN specialists are comprised of three major conditions. These are: Ligation and division of fallopian tubes; and hysterectomies and oophorectomies/salphingoophorectomies. In total, the panelists estimated that OB/GYN specialists should perform over 85 percent of the gynecologic surgery and 75 percent of the obstetrical surgery (excluding cesarean-sections). Procedure time was variable across conditions ranging from a low of 0.5 hours for colporrhaphies, dilations and curretages (D&Cs) and repair of lacerations after delivery to a high of 1.7 hours and 3.3 hours respectively for hysterectomies and microsurgery. The same variation is evident for associated inpatient visits. The former ranged from a low of 1.0 visit for local excision and destruction of lesions, D&Cs and antepartum procedures to terminate pregnancies to a high of 8.0 for local excision and destruction of ovarian lesions, 8.5 for microsurgeries, 9.0 for plastic repair of cystocoel and rectocoel and 9.5 for hysterectomies. Outpatient visits for surgical procedures were less variable and hovered between two and three visits. Lastly, some procedures were estimated to be performed frequently as secondary ones. Among these are local excision and destruction of lesions (80.0 percent), plastic repair of cystocoel and rectocoel (80.0 percent), repair of laceration after delivery (97.5 percent), salphingectomy, bilateral (90.0 percent), oophorectomy/ salpingoophorectomy (67.5 percent) and colporrhaphies (60 percent). Overall, a total rate of 4,767 surgical procedures per 100,000 women were estimated for 1990; 84 percent of which should be performed by the OB/GYN specialist. Total professional requirements for these services equal 6,901 FTE OB/GYN specialists in 1990, upon dividing a total of 4,724,869 surgical hours by a yearly FTE surgery productivity of 1,325 hours (29 hours per week 45.6 weeks per year = 1,325 hours per year) and 23,426,810 visits by an inpatient/ outpatient FTE productivity of 7,022 visits (124 visits for 23.4 hours week = 154 for 29 hour week x 45.6 weeks per year = 7,022 visits).

It should be noted that in its deliberations, the Delphi Panel adjusted the rates for surgical procedures for 1990. For example, hysterectomies, which were estimated to be performed at a rate of 663 per 100,000 women in 1975, were decreased 40 percent for 1990 to a rate of 399, indicating present excessive performance of the procedure. Even with this dramatic decrease, hysterectomies remain the second major surgical procedure in the practice of FTE surgical specialists. Panelists also increased the rate of ligations and divisions of fallopian tubes from 1,170 per 100,000 women to 1,257 per 100,000 women, an increase of 7 percent, indicating a growth in the number of sterilizations taking place.

Delivery Service Requirements--The last and the major area of impact on OB/GYN professional service requirements is delivery care. Panelists accepted the 1990 Census Bureau projection of over 3,900,000 births in 1990. When calculated in terms of a rate for women 17 and over, a total of 4,160 births per 100,000 women 17 and over are projected for 1990. Panelists agreed that 75 percent of all these births should be delivered and completely handled by the OB/GYN team. Of these, 7 percent (5.3 percent of all births) should completely accrue to the appropriately trained nonphysician provider, who would perform the delivery and provide all prenatal/postpartum care. Twenty percent of these births, on the other hand, should be completely handled by the OB/GYN specialist since they comprise high risk births. Over one half of these high risk births were estimated to be cesarean sections (c-sections). The remaining 73 percent of all births accruing to the team should be jointly handled by the team. The OB/GYN specialist should perform all of these deliveries and 2/3 of the associated prenatal/postpartum visits, with the remaining one-third of the visits being delegated. The average delivery (excluding c-sections) was estimated to require 4.3 hours of time and 14.0 inpatient/ outpatient visits. C-sections were estimated to require 1.5 hours.

Decisions made by panelists were based on an adaptation of current practice. One high risk screening program found, for example, that 20 percent of births are high risk in the intrapartum stage only and 16 percent are high risk in both prenatal and intrapartum stages (Hobel; September 1973). Currently, nurse-midwives perform 1.0 percent of all deliveries (Research and Statistics Committee of the American College of Nurse-Midwives). On the basis of their skill and training, panelists felt that the majority of nonhigh risk births could accrue to nonphysicians, who are appropriately trained. However, due to the insufficient expected supply of nonphysician health care providers and an abundant supply of OB/GYN specialists, panelists increased the current role to only approximately 5.3 percent of all births (7 percent accruing to the OB/GYN team). Lastly, in terms of norms of care allocated for deliveries, 11 prenatal visits represent the median for all mothers and 12 for mothers who began care in the first trimester of their pregnancy (National Center for Health Statistics; April 28, 1980). Adding an average of 2.0 pospartum visits to this, equals a total of 14.0 visits, which the Panel adopted as a norm.

Upon calculating prenatal-postpartum needs along with needs for the actual delivery, a total of 12,257 OB/GYN specialists were estimated to be needed for delivery care in 1990, as is seen in Table III.L.4.

Professional Requirements for Teaching, Research and Administration and Total Professional Requirements--The Delphi Panel decided to estimate requirements for teaching, research and administration on a percentage basis. Panelists agreed that approximately 6.3 percent of patient care requirements would be needed for nonpatient care activities. As is shown in Table III.L.5 this results in a need for 1,570 FTE OB/GYN specialists for nonpatient care activities in 1990.

Viewing the preceding, it appears that the strong impact on OB/GYN professional requirements for 1990 is found in the surgical and delivery components. Together, over 19,000 FTE OB/GYN specialists will be required for these two activities in 1990. This approximates over 68 percent of their total professional requirements. Comparing the Delphi Panel estimates to the projected supply of OB/GYN specialists in 1990 which totals over 30,000 OB/GYN specialists indicates that there may be a potential oversupply of OB/GYN specialists in 1990.

3. Modeling Panel Review of OB/GYN Delphi Panel Estimates

The Delphi Panel recommendations were provided to the Modeling Panel of GMENAC for review. At several sessions of meetings, the Modeling Panel reviewed each of the major components in the practices of OB/GYN specialists and attempted to adjust the responses upon consideration of the advice of Delphi panelists and data presented them from other Delphi Panels, such as the Adult Medical Care and General Surgery Panels. In addition, the Modeling Panel considered suggestions obtained from the Nonphysician Provider Panel of GMENAC regarding adjustments to the figures for maximum potential delegation which were obtained from the Delphi Panel in OB/GYN. All of the revisions from the Modeling Panel were then reviewed and accepted by GMENAC.

Table III.L.4

RECOMMENDATIONS FOR DELIVERIES FOR OB/GYN SPECIALISTS IN 1990 (EXCLUDING DELIVERY CARE PROVIDED BY NONPHYSICIANS) (DELPHI PANEL RESPONSES)

	1990 Rate Per 100,000 Women 17+ to OB/GYN Specialist	Average No. of Delivery Hours	Average No. of Patient Visits	Total Hours	Total Visits
Normal (Entire Care)	269	4.3	14.0	1,157	3,766
Normal (Partial Care)	2,276	4.3	9.3	9,787	21,167
C-Section	355	1.5	14.5	511 b/	4,955 b/
Total	2,900 a/			11,455 *	29,888 *

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* Dividing the visit rates by the surgical/nonsurgical visit productivity of an OB/GYN specialist (7,022 visits) and the hours by the time productivity of an OB/GYN specialist in surgery (1,325 hours) yields a need for 12,257 OB/GYN FTE specialists for deliveries.

a/ This figure represents 69.7 percent of all expected births in 1990 and excludes 7 percent of all deliveries accruing to the OB/GYN team (i.e., an additional 5.3 percent of all deliveries) which should be handled by an appropriately trained nonphysician provider.

b/ These estimates have been corrected since 8 percent of C-Sections were estimated to be performed as secondary procedures.

Table III.L.5

OB/GYN SPECIALIST PROFESSIONAL REQUIREMENTS FOR 1990 (DELPHI PANEL RESPONSES)

Type of Care	Requirements
Ambulatory Care	4,666
Hospital Nonsurgical Care	1,096
Surgical Care	6,901
Deliveries	12,257
Teaching, Research, Administration	1,570
Total	26,490

Ambulatory Care Requirements--The major adjustments forwarded by the Modeling Panel were made to the respective shares for each of the major conditions which should accrue to the OB/GYN team and in particular, the OB/GYN specialist. The Modeling Panel basically accepted the recommendations of the Delphi Panel in OB/GYN regarding the percentage of people with neoplasms of the genitourinary organs, genitourinary diseases, and family planning who should receive services from the OB/GYN team. Decreases were made to such areas as venereal diseases, obesity, common colds, and hypertension. In addition, the Modeling Panel decreased service requirements for well care, similar to that suggested by the American Cancer Society (ACS). For example, tri-annual examinations were recommended for women 17 through 40 and bi-annual exams were recommended for women 40 thru 60 by the Modeling Panel. This differs from ACS which recommended annual exams for women over 40, instead of bi-annual exams.

Depicted in Table III.L.6 is the percentage distribution of major conditions in the gynecologic ambulatory component of the practice of OB/GYN specialists:

Table III.L.6

CONDITION GROUPINGS OF MAJOR IMPACT ON OB/GYN
SPECIALIST SERVICE REQUIREMENTS

Condition Groupings	% of Ambulatory Gynecologic Practice	
	DELPHI PANEL	GMENAC
Infectious and Parasitic Diseases	13.1	7.8
Endocrine, Nutritional and Polyglandular Diseases	0.1	0.1
Neoplasms	3.0	4.0
Diseases of the Circulatory System	4.5	0.9
Diseases of the Genitourinary System	53.7	50.0
Complications of Pregnancy Childbirth and Puerperium	5.3	6.8
Symptoms and Ill-Defined Conditions	2.4	0.6
Well Care	6.4	20.4
Family Planning	10.8	8.5
Sexual Counseling, Rape Managment	0.7	1.0
Total	100.0	100.0

The impact of genitourinary diseases on the practices of OB/GYN specialists remains strong, requiring over 50 percent of FTE OB/GYN specialists involved in ambulatory care for nonsurgical gynecologic conditions. In contrast to the Delphi Panel estimates, the well care role of OB/GYN specialists increases from 6.4 percent to over 20 percent of their practices. This is due mainly to the adjustment in the delegation for well care made by the Modeling Panel. The Delphi Panel recommended that over 60 percent of well care visits should be delegated. The Modeling Panel decreased this to 15 percent based on supply constraints of nonphysician health care personnel. As a consequence of the increases made to well care, the impact of infectious and parasitic diseases and family planning decreases. The impact of infectious and parasitic diseases was also affected by the Modeling Panel's decision to decrease the recommended role of the OB/GYN team in the provision of services for venereal diseases, due to the large role played by generalists and public clinics in the treatment of such conditions.

As a result of the Modeling Panel changes in OB/GYN, a decrease of nearly 43 percent of requirements to the OB/GYN team was made. However, the Modeling Panel decreased the maximum potential delegation estimates of the OB/GYN Delphi Panel of GMENAC from over 40 percent of visits accruing to the team to 18 percent because of an expected insufficient supply of nonphysicians and a more than sufficient supply of OB/GYN specialists in practice. Thus, the revised total of service requirements specifically accruing to the OB/GYN specialist represent only a 20 percent decrease and not a 43 percent decrease of the Delphi Panel's estimates. Hence, a total of 34,345,442 visits by the OB/GYN specialist should be required in 1990, employing the services of 3,766 FTE OB/GYN specialists.

The percentage distribution shown in Table III.L.7 is obtained as a result of the Modeling Panel's adjustments to delegation figures.

Table III.L.7

CONDITION GROUPINGS OF MAJOR IMPACT ON OB/GYN DELEGATION FOR GYNECOLOGIC CONDITIONS

Condition Groupings	% of Ambulatory Gynecologic Delegation	
	DELPHI PANEL	GMENAC
Infectious and Parasitic Diseases	16.4	15.2
Endocrine, Nutritional and Polyglandeular Diseases	0.5	0.2
Neoplasms	0.1	0.1
Diseases of the Circulatory System	7.9	1.6
Diseases of the Genitourinary System	35.7	49.3
Complications of Pregnancy, Childbirth and Puerperum	1.3	2.1
Symptoms and Ill-Defined Conditions	0.7	0.3
Well Care	15.9	7.0
Family Planning	21.1	23.3
Sexual Counseling, Rape Management	0.4	0.8
Total	100.0	100.0

The preceding figures indicate that except in the case of well care, the distributions of delegated conditions remains consistent with that obtained from the Delphi Panel. Diseases of the genitourinary system, infectious and parasitic diseases and family planning comprise nearly four-fifths of all gynecologic ambulatory delegation.

Nonsurgical Hospital Care--The Modeling Panel of GMENAC recommended minor modifications be made to the nonsurgical hospital data provided by the Delphi Panel. While the Delphi Panel stated that all nonsurgical patients should be seen by the OB/GYN specialist while hospitalized, the Modeling Panel recommended that only 90 percent should. Furthermore, the Modeling Panel further decreased the share accruing to the OB/GYN specialist for chronic cystic breast disease to 30 percent of all cases. This alteration affects professional requirements by 6.5 percent. As a result of the Modeling Panel recommendations, a total of 981 FTE OB/GYN specialists would be required for hospital nonsurgical care in 1990, as compared to the 1,096 estimated by the Delphi Panel, a difference of 10.5 percent.

Surgical Requirements--As in the case of nonsurgical care, the Modeling Panel only slightly modified the Delphi Panel requirements for surgical care. Procedure time for hysterectomies was increased from 1.7 hours to 2.2 hours as was the procedure time for D&Cs increased from 0.5 hours to 0.8 hours. These adjustments were made on the basis that the time estimates provided for each procedure should not be "skin-to-skin" but "door-to-door" time which is not reflected in the Delphi Panel's estimates. Secondly, a comparison of the time allocations for these procedures with the time allocation provided for comparable and lesser involved procedures indicated that the procedure time for D&Cs be increased.

The Modeling Panel also increased associated inpatient visits for D&Cs from 1.0 to 1.3 and decreased the average outpatient visits for hysterectomies from 3.0 to 2.0. Hysterectomy visit allocations were decreased in line with recommendations forwarded by the General Surgery Panel.

In total, GMENAC adjustments to the surgical estimates emanating from the Delphi Panel increased the number of FTE OB/GYN specialists required for surgical care in 1990 by nearly 4 percent from 6,901 to 7,185 FTE OB/GYN specialists. Depicted in Table III.L.8 is the percentage distribution of surgical procedures incorporating GMENAC modifications.

The three main procedures remain ligation and division of fallopian tubes, oophorectomies/salpingoophorectomies and hysterectomies. However, due to the increase in procedure time, requirements for hysterectomies take precedence over the others in the distribution.

Table III.L.8

SURGICAL SERVICE REQUIREMENTS OF THE OB/GYN SPECIALIST

Surgical Procedures	Percentage of All Surgical Service Requirements	
	DELPHI PANEL	GMENAC
Ligation and Division of Fallopian Tubes, Bilateral	21.6	20.7
Oophorectomy, Salpingoophorectomy	14.6	14.1
Hysterectomy	19.8	20.8
Dilation and Curretage, Diagnostic	6.4	8.4
Plastic Repair of Cystocoel, Rectocoel	3.9	3.4
Obstetrical Surgery, excluding C-Sections	6.3	6.0
Other	27.4	26.4
Total	100.0	100.0

Deliveries--Extensive review of the delivery service requirements recommended by the Delphi Panel was made by the Modeling Panel of GMENAC. Displayed in Table III.L.9 are the final numerical recommendations forwarded by GMENAC:

Table III.L.9

SERVICE REQUIREMENTS FOR DELIVERY CARE ACCRUING TO THE OB/GYN SPECIALIST

All Deliveries	1990 Rate Per 100,000 Women 17+ to OB/GYN Specialist	Average No. of Delivery Hours	Average No. of Patient Visits	Total Hours	Total Visits
Normal (Entire Care)	416	3.0	14.0	1,248	5,824
Normal (Part. Care)	1,602	3.0	11.2 a/	4,806	17,943
C-Section	624	1.5	14.0	936	8,736
Total	2,642 *			6,990 b/	32,503 b/

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* This represents 63.5 percent of all deliveries and excludes 5.0 percent of all deliveries totally handled by the appropriately trained nonphysician working with the OB/GYN specialist.

a/ This represents four-fifths of visits for deliveries. The remaining one- fifth accrues to the nonphysician provider of the team.

b/ Dividing the visit and time requirements by the above-mentioned productivity of an OB/GYN specialist yields an approximate need for 9,409 FTE OB/GYN specialists in 1990.

The most basic change recommended by the Modeling Panel was to decrease the percentage of births accruing to the OB/GYN team from 75 percent to 68.5 percent. This was done on the basis that the family practitioner's training curriculum includes delivery care and that an increasing number of family practioners will be providing these services in the future. Currently, as stated by the Delphi panelists, generalists perform less than 20 percent of all deliveries, however, in the past they have performed approximately one-third of them.

Secondly, the Modeling Panel increased the rate of births completely handled by the OB/GYN specialist from 15 percent of all births to 25 percent of all births, realizing that they are not all high risk births. In doing this, the percent of all births jointly handled by both the OB/GYN specialist and the nonphysician health care provider decreases from near 55 percent to 39 percent of all births. This change was made on the basis that there will be a sufficient supply of OB/GYN specialists in 1990 to provide more delivery services.

The Modeling Panel further decreased the time allocated for deliveries from 4.5 hours to 3 hours in line with that recommended by the Adult Medical Care Panel and an OB/GYN specialist's suggestion. Visits allocated for c-sections were also slightly decreased from 14.5 to 14.0 in line with the number suggested for other deliveries. Lastly, the rate for c-sections was increased, upon the advice of an OB/GYN specialist, to 15 percent of all births, all of which should be handled by the OB/GYN specialist. Data from the 1977 National Center for Health Statistics (NCHS) indicate that nearly 14 percent of all births were c-sections, which is a dramatic increase from the past. Lastly, the Modeling Panel, upon the suggestion of the Nonphysician Provider Panel of GMENAC, decreased the proportion of visits provided by the nonphysician provider from 1/3 to 1/5 of all prenatal/postpartum care. This change was made on the assumption that supply constraints of nonphysicians would prohibit additional delegation and that a large supply of OB/GYN specialists would be available to provide these services.

In total, based on the Modeling Panel's adjustments, 9,409 FTE OB/GYN specialists should be required for deliveries in 1990. This figure is 23 percent less than that advocated by the OB/GYN Delphi Panel, based on its operating instructions and assumptions to eliminate requirements on the basis of what "should" occur in 1990.

Total Requirements for OB/GYN Specialists--Comparing the total professional requirements for OB/GYN specialists as estimated by the Modeling Panel with those of the Delphi Panel, a decrease is noted (see table III.L.10). The Modeling Panel estimates that 22,686 OB/GYN specialists are required for 1990 which is a decrease from the 26,490 estimated by the Delphi Panel. The main decrease is due to the Modeling Panel's revisions in delivery care. Estimates from both Panels indicate a potential oversupply in the number of OB/GYN specialists in practice by 1990. Since GMENAC felt that time was required for the Graduate Medical Education (GME) system to adjust to the decreased need for OB/GYN specialists, a range of between 23,000 and 25,000 OB/GYN specialists was recommended for 1990.

Table III.L.10

OB/GYN SPECIALIST PROFESSIONAL REQUIREMENTS FOR 1990
(GMENAC Recommendations and Delphi Panel Responses)

Type of Care	DELPHI PANEL	
GMENAC		
Ambulatory Care	4,666	3,766
Hospital Nonsurgical Care	1,096	981
Surgical Care	6,901	7,185
Deliveries	12,257	9,409
Teaching, Research, Administration	1,570	1,345
Total	26,490	22,686

M. DERMATOLOGY

1. Overview

The specialty of dermatology has unique features which impact upon the process of estimating professional requirements for 1990. Although a vast majority of skin diseases are visible to the untrained observer, a large number of the diseases remain untreated even in a full access system. Populations which heavily employ the services of dermatologists include persons between the ages of 15 and 29 in addition to higher income, urban and highly educated groups (Krasner, et al., 1977). As such, dermatologic services are highly dependent upon "anticipated changes stemming from alterations in population traits" and as a consequence are driven by population demand (Krasner, et al., October 1977). Thus, the preceding, in conjunction with the existence of access barriers to services, limits the suitability of a strict physician-defined needs-based model in projecting physician requirements for dermatology in 1990.

Predominantly, dermatology is office based. Hospital staff personnel--excluding residents--comprise only 8.3 percent of office based personnel according to American Medical Association data for December 31, 1978 (Center for Health Services Research and Development, AMA, 1979). Moreover, the average dermatologist spends at most 7 to 8 percent of his/her time in the hospital (Mendenhall, 1977).

In the ambulatory component of dermatology practice, the current employment of specially trained nonphysician providers is extremely limited for several reasons. There are no civilian training programs in operation and of the approximately 200 persons trained in the military since 1979, only 8 percent utilize their training in civilian life. The problem in the employment of formally trained nonphysician providers is compounded by the reluctance of dermatologists to utilize formally trained nonphysician providers, as evidenced in surveys conducted in California, Louisiana, and informal communication from New York (Krasner, et al., 1977; Welton, 1972). This reluctance arises because it is uneconomical in our present health care system to employ the formally trained nonphysician provider. Furthermore, it is difficult to estimate the present amount of delegation that occurs in dermatology, although in one study of nonphysicians employed in primary care settings, indication was made that diseases of the skin and subcutaneous tissue were very appropriate areas for delegation (Steinwachs, et al., 1976). Other studies have found that the productivity of physicians can be enhanced from 30 to 40 percent by employing nonphysicians (Spitzer, et al., 1974, Nelson, et al., 1975, Schiff, et al., 1969, Lave, et al., 1976, Steinwachs, et al., 1976).

Although the literature has indicated productivity gains stemming from utilization of nonphysicians, caution is advisable for several reasons. If the need for dermatologists centers on the provision of specialized services for the more severe skin conditions, the applicability of findings on potential delegation taken from a primary care setting to dermatology becomes questionable. Secondly, delegation of tasks may presently exist on an informal basis to nurses and aides currently employed in the offices of dermatologists. Lastly, if dermatologists and their practices are currently observed to be very efficient, further enhancement of efficiency by increased task delegation becomes dubious.

2. Documentation of the Manpower Requirements Calculation

In order to calculate professional requirements in dermatology for 1990, a Delphi Panel of six experts was selected to review the GMENAC generic model and a series of reference data which could serve as potential inputs in estimating the number of professionals needed in the field of dermatology. The Panel chosen consisted of three dermatologists, one family practitioner, one pediatrician, and one general internist. They were selected by GMENAC after review of a list of potential candidates submitted to GMENAC by their respective professional organizations and GMENAC members. During three sessions of meetings they reviewed and amended both the generic model and existing data bases in order to estimate the need for dermatologists.

Application of Generic Model--Although dermatology is a market driven specialty, an attempt was made to derive requirements for the specialty utilizing a needs-based approach. Because of the unique aspects of dermatology regarding the ambulatory-based nature of the specialty and the low utilization and availability of formally trained nonphysician providers in dermatology, the generic "adjusted-needs" based model was slightly modified in the estimation of professional requirements. As depicted in the model below, ambulatory care requirements were calculated utilizing a physician-defined need approach for dermatologic morbidities. No subtraction was made for total visits which should be delegated by 1990. The members of the Panel felt that persons cared for by dermatologists should be the more severe cases whose treatment not only requires a physician but a specialized doctor in dermatology which precludes visit delegation. However, panelists did agree that task delegation, primarily to informally trained personnel, does occur. Hence, they provided estimates on the percentage of each visit for every condition which should be delegated in 1990 beyond that which currently is delegated. These estimates were averaged across all conditions and applied as an increment to the baseline productivity of dermatologists.

Hospital care professional requirements were not calculated separately on a morbidity specific basis since few dermatologists are hospital based and very little time is spent in a hospital setting by the average dermatologist. To derive needs for hospital care, time spent in the hospital by the average practicing dermatologist was prorated to time spent in an ambulatory setting and ambulatory care requirements were multiplied by this factor to estimate total hospital care professional requirements.

Lastly, since ambulatory and hospital professional requirements were calculated on the basis of the average dermatologist involved in the provision of patient care, the Panel separately estimated the number of dermatologists which should be required for teaching, research, and

Figure III.M.1

DERMATOLOGY ADJUSTED NEEDS BASED MODEL

$$\frac{\left[\begin{array}{c}\text{Morbidity rate}\\ \text{for 1990}\end{array}\right] \text{X} \left[\begin{array}{c}\text{\% Requiring}\\ \text{ambulatory}\\ \text{health}\\ \text{care}\end{array}\right] \text{X} \left[\begin{array}{c}\text{\% Requiring}\\ \text{a}\\ \text{dermatologist}\end{array}\right] \text{X} \left[\begin{array}{c}\text{Average no.}\\ \text{of annual}\\ \text{visits per}\\ \text{condition}\\ \text{by}\\ \text{dermatologist}\end{array}\right]}{\left[\begin{array}{l}\text{baseline productivity of average}\\ \text{practicing dermatologist *}\end{array}\right] + \left[\begin{array}{l}\text{\% by which productivity can be}\\ \text{increased thru maximum}\\ \text{delegation in 1990}\end{array}\right]}$$

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* practicing dermatologist refers to one who is primarily involved in the provision of direct patient care.

administration. Present supply figures of personnel in these areas were increased in order to provide for the better training of generalists in the detection and treatment of dermatologic conditions.

Background Data for Dermatology--To aid Delphi panelists in providing morbidity and norms of care estimates for 1990, background statistics were collected from various sources on current prevalence of dermatologic conditions and utilization of dermatologic services. In addition, data were provided on the percentage of people with each condition who sought the aid of a physician and the percentage of all visits for a condition which accrue to the dermatologist in order to serve as guidelines in determining what proportion of each morbidity should require medical care and in particular medical care from a dermatologist.

The principal source of morbidity statistics provided to panelists was the Health and Nutrition Examination Survey (HANES) undertaken in 1971-1974. In this survey, a group of dermatologists--predominantly residents--physically examined 20,799 persons aged 1 thru 74 for skin conditions. A condition was recorded as being significant if the examiner felt that the condition required the intervention of a physician. Considerable variation was observed regarding the number of patients considered to have significant skin pathology. Nevertheless, the HANES is considered to be most reliable source of prevalence data for skin diseases.

In order to estimate the percentage of persons requiring medical care, data from the Health Interview Survey (HIS) was provided as a springboard for panelist responses. These data were taken from consumer self-reports of their health. The National Ambulatory Medical Care Survey (NAMCS) provided data from physicians in office-based practices on the percentage of all visits to physicians which accrue to dermatologists in order to guide panelists in determining the percentage of people with a particular morbidity in need of treatment who should see a dermatologist.

Norms of care data from various sources were provided to panelists to assist them in their deliberations. Among the sources from which data were extracted are the NAMCS and the Kaiser and Columbia group health plans. Panelists were asked to review utilization data from various organizational settings to aid them in determining the amount of care by a dermatologist they, as experts, feel is appropriate for a given condition, given the facts that differing practice arrangements exist and that care within one may be more intense than another.

Results of Delphi Process in Dermatology--In determining professional requirements in dermatology, Delphi Panel members were provided reference data for all major skin-related conditions as taken from the International Classification of Diseases - VIII. (ICDA) Due to the inapplicability of the ICDA Coding Schema for dermatology, panelists decided it was necessary to regroup dermatologic conditions into a coding system which is compatible with their practice content.

Since the practice of dermatology focuses primarily upon the treatment of 25 to 30 conditions, panelists chose to consecutively address each decision point in the model for the 28 most frequently seen diseases in their practices. Based on their expertise as well as survey data taken from NAMCS, the University of Southern California Profiles of Practice Study and the National Disease and Therapeutic Index Survey (NDTI), the Panel decided to prorate requirements for the remainder of their ambulatory practice assuming that the 28 major conditions comprise 90 percent of their ambulatory practice. As indicated earlier, panelists also agreed to deal with the issue of delegation in terms of task delegation which enhances the productivity of dermatologists.

Where HANES data on significant pathologies were available, panelists generally accepted them as the most reliable estimate on the prevalence of significant dermatology conditions. In some instances, in particular skin cancers and tumors and infectious and parasitic diseases, panelists utilized reference data obtained from other sources. These were the Health Interview Survey (HIS), Center for Disease Control (CDC) and data derived from incidence and survival rates for cancer obtained by the American Cancer Society. For the majority of infectious and parasitic diseases, panelists unanimously agreed that tremendous underreporting was present. Consequently, the prevalence of significant cases of such diseases as local infections of skin and subcutaneous tissue, herpes zoster, moniliasis and infestations were increased by as much as five-fold.

Because of the decision to utilize the HANES prevalence data the panelists focused their efforts on estimating needs for the treatment of significant skin conditions, which HANES defined in terms of disease requiring the intervention of a physician. For several of these conditions, including verruca vulgaris, dermatophytosis, tinea versicolor, seborrheic dermatitis and acne, panelists applied a conservative need for treatment compared to HANES data, in which all significant prevalence estimates were deemed in need of physician care. In the cases of dermatophytosis, tinea versicolor and seborrheic dermatitis, panelists agreed that only 20 percent of the HANES significant prevalence required physician intervention and for verruca vulgaris and acne only 50 percent and 65 percent respectively required treatment.

Panelists further differentiated persons who needed care specifically from a dermatologist. Included among those conditions which the Panel felt required dermatologic intervention for greater than one-half of all cases requiring care are: molluscum contagiosum; malignant melanomas; dermatomyositis; seborrheic dermatitis; eczema; psoriasis; actinic senile keratosis; and acne. In contrast to this, a minor role by the dermatologist was advocated for conditions such as local infections, herpes zoster, herpes simplex, pruritic conditions, urticaria and drug induced eruptions of the skin because the nature of these conditions, including their incidence and the familiarity of generalists with these conditions, allows them to be treated as readily in other ambulatory facilities. In addition, conditions such as dermatophytosis, tinea versicolor, benign neoplasms, cysts and nevi, and pityriasis rosea often require minor intervention by the dermatologist due to their self-limiting nature.

According the the Delphi Panel, the largest number of ambulatory care visits to a dermatologist should be provided to those who have psoriasis (seven annual visits) and acne (six annual visits). It should be noted that the high number of visits for acne is an average provided by the Panel assuming that they should see those persons who have moderately severe or very severe acne and hence require an average of six annual visits for the monitoring of tetracycline treatment.

Upon calculating the total number of visits per year for every dermatologic condition, a total of 105,797,154 visits would be required for 1990, not correcting for simultaneous care provided for coexisting conditions. In these estimates panelists were to include an estimate of the care that only a trained dermatologist should provide given his/her unique training. Total visits for the following two conditions comprise nearly 50 percent of these requirements:

Condition	No. of Visits	% of Total
Acne	41,649,124	39.5
Psoriasis	8,437,724	8.0

In order to translate service requirements into personnel, information on the productivity of the average dermatologist engaged in the provision of direct patient care is needed. Panelists reviewed productivity data for dermatologists from various sources, which ranged from a low of 4,100 annual ambulatory visits, a figure derived from HIS computer data which applied to all dermatologists, to a high of 9,000 visits as taken from practicing dermatologists in Health Insurance Plan of Greater New York (HIP) (Krasner, et al., 1977, p. 80). The Panel adopted 7,000 annual visits as a baseline productivity level for the average practicing dermatologist in 1990, which approximates data derived from the USC Profiles of Practice Study (Mendenhall, 1977). Assuming an annual productivity of 7,000 ambulatory visits approximates six hourly visits for five direct patient care hours per day for 5 days a week at 46 weeks per year. This figure includes all informal task delegation which presently exists in the practice of dermatologists.

Panelists were asked to estimate the percentage of each visit which could be delegated, but presently is not, in order to account for maximum potential task delegation for 1990. These responses were averaged across all conditions in order to arrive at one figure by which productivity can be expected to increase by 1990. Two panelists felt that either no additional delegation could take place--since maximum efficiency occurs in dermatologic practice--or that it was impossible to estimate maximum delegation. Another two panelists felt that over 40 percent of tasks should be delegated and two felt that between 17 percent and 26 percent of visits should be delegated. As a result of utilizing the average estimate across panelists, an average of 18 percent of each visit was estimated to be delegable, and as a consequence the productivity of the average practicing dermatologist increases by 18 percent from 7,000 to 8,500 annual visits.

Before estimating the total professional requirements in dermatology, a correction factor had to be developed for coexisting conditions.

Estimates provided by panelists did not assume that each condition exists independently of others. Initially panelists indicated that the chronic conditions of collagen and vascular diseases, dyshydrosis and eczema and psoriasis occur simultaneously. However, at a GMENAC plenary session the issue of simultaneity was discussed in detail and a preliminary factor of 1.2 for all dermatologic visits derived from NAMCS visit files was presented. However, experts in dermatology present at the meeting indicated this NAMCS estimate was slightly high. Consequently, GMENAC adopted a correction factor of 1.1 across all ambulatory conditions in the practice of dermatologists.

Correcting the ambulatory care service requirements for simultaneity and dividing by the average productivity of the practicing dermatologist yields a need for 11,315 dermatologists for ambulatory care. This assumes maximum task delegation should occur in 1990.

Prorating the time dermatologists spend in the hospital to that devoted to ambulatory care results in increasing the total number of dermatologists by 905 since the Panel estimated that 8 percent as much time is spent in hospital care. This time estimate for hospital care was taken from the USC Profiles of Practice Study and was accepted by the Panel as indicative of the practice of dermatology.

Panelists, lastly, estimated personnel requirements for teaching, research and administrative using the following guidelines:

> There are currently approximately 116 hospital training programs for allopathic physicians in the United States. Of these, 72 are estimated to have residencies in dermatology. Of the 44 remaining, the Panel estimated that each staff should have three faculty members in dermatology to train residents in other programs, requiring approximately 132 allopathic dermatologists. In addition, the mean number of faculty presently employed in those programs which have residencies in dermatology equals 3.7, requiring 269 full time dermatologists. Since the Panel felt that an additional two staff persons should be added to each residency program to assist in the training of nondermatologists for dermatologic conditions, the total would approximate 410 faculty for existing residency programs in 1990. Upon adding these to the 132 needed in programs without a residency, the total requirement of faculty slots would equal approximately 542 dermatologists. Currently, according to AMA data, in December 1978 there were 268 dermatologists engaged in teaching, research, administration and other activities (Center for Health Services Research and Development, AMA, 1979).

Thus, according to the expert group of consultants, a total of 12,762 dermatologists should be required in 1990. However, panelists strongly felt that paternalisticaly defined need does not grasp the market forces and patient desires which lie behind the utilization of dermatologic services. As a consequence, they feel that increasing the supply of dermatologists to nearly 13,000 by 1990 is inappropriate, and that a more realistic need--as the one adopted later by GMENAC--be recommended.

Activity	Number of Dermatologists	% of Total
Ambulatory Care	11,315	88.7
Hospital Care	905	7.1
Teaching, Research and Administration	542	4.3
Total	12,762	100.1

3. Modeling Panel Review of Dermatology Dephi Panel Estimates

Delphi Panel responses on each decision point were provided to the Modeling Panel of GMENAC and later the full Committee for review. In general, the Modeling Panel made several adjustments to the Delphi Panel data, with the realization that dermatologic needs are likely to be nonlife threatening and that the practices of dermatologists are highly influenced by market forces.

At a series of meetings, the Modeling Panel suggested the following adjustments, which later were approved by GMENAC:

> Norms of care for atopic and infantile dermatitis should be decreased from four units to three. Only 20 percent of persons in need of care with contact dermatitis should seek their care from a dermatologist, as compared to the Delphi Panel recommendation of 40 percent. Of the estimated 1,339,000 persons with significant psoriasis, only 50 percent, instead of 90 percent, should see a dermatologist for five instead of seven annual visits. Actinic senile keratosis patients in the dermatologist's office should average two annual visits instead of four. Lastly, in the case of acne, which impacts the most upon dermatologic service requirements, a patient-defined "need rate," as taken from the HANES, was utilized by the Modeling Panel as being indicative of a "realistic need," incorporating patient desire and economic constraints. This rate equals 1,770 per 100,000 persons as compared to the physician defined need rate of 6,265 used by Delphi Panel members as a normative ideal. Both rates were based on the total amount of acne reported among men between the ages of 17 and 24 and women 17 thru 40 and were applied to the total U.S. population. The Modeling Panel also felt that the annual number of visits for acne should be decreased from six to four.

The Modeling Panel estimated a simultaneity correction factor of 1.1 which is .1 lower than that found for dermatologic visits from the NAMCS data. Utilizing the average productivity of the practicing dermatologist, as taken from the Delphi Panel, a total number of 6,019 dermatologists would be required to provide ambulatory care. This compares with 11,315 needed according to requirements as estimated by the Delphi Panel, which operated on the assumption of physician-defined "should".

One final revision accepted by GMENAC was a decrease in the requirements for hospital care from 8 percent of ambulatory requirements to 6.5 percent of ambulatory requirements. If 6,019 dermatologists are needed for ambulatory care in 1990, a total of 391 would be needed to staff hospitals. Adding ambulatory and hospital requirements to those projected for teaching, research and administration (542 dermatologists), yield a total of 6,952 dermatologists in 1990, according to GMENAC. In order to account for a margin of error, GMENAC voted to accept a range of between 6,700 and 7,200 dermatologists for 1980.

1990 REQUIREMENTS FOR DERMATOLOGISTS

Activity	Delphi Panel	GMENAC
Ambulatory care	11,315	6,019
Hospital care	905	391
Teaching, research and administration	542	542
Total	12,762	6,952

N. EMERGENCY MEDICINE

1. Overview

Emergency medicine is a very new specialty, having only received specialty status from the American Board of Medical Specialties in September of 1979; yet physicians have been practicing emergency medicine since 1961 when four Alexandria, Virginia physicians discontinued their office practices to become hospital-based, full-time emergency physicians. Consequently, there are a large number of physicians rendering emergency care who have not had formal emergency medicine training. The specialty is, thus, in a unique position with regard to board certification. Board certification is by examination and has only recently been initiated. As of July 1980, there will be approximately 250 board certified emergency physicians. Emergency medicine is in a "catch-up" position at this time, and it is estimated that by 1982 there will be 1,200 board certified emergency physicians. Until the backlog has been diminished and all eligible emergency physicians have been examined, however, there will be a large number of nonboard certified emergency physicians in emergency departments.

As a new specialty, emergency medicine is in a period of very rapid growth. The American Medical Association (AMA) reports that as of December 1975, 2,340 physicians listed emergency medicine as their primary specialty; by December 1978, their number had grown to 4,810, representing an increase of 105.6 percent. In contrast, the total physician population has grown from 393,742 to 437,486 during the same time span for a more modest increase of 11.1 percent. A further growth is anticipated for the emergency physician population in 1979, as preliminary unpublished data from the AMA indicate that 5,080 physicians listed emergency medicine as their primary specialty in that year.

The newness of the emergency medicine specialty is also reflected in the rapid growth of residency programs and the number of graduating residents with a concomitant need for physicians involved in teaching. In 1972 the specialty witnessed the graduation of its first two residents. Four years later, there were 36 emergency medicine residency programs in various stages of development and 116 residents graduated, for a total of 741 from 43 approved programs by July 1980. It is anticipated that in July 1981 their ranks will be augmented by 290 residents who will graduate from 47 approved programs. The American College of Emergency Physicians (ACEP) estimates that by 1990 there will be 100 approved programs in operation.

The newness of the specialty impacts on the validity of current supply estimates for emergency medicine. The Modeling Panel, for example, felt that there is a significant undercount in the AMA supply data of emergency physicians. There are probably many other physician specialists who provide emergency care, as well as retired physicians and "moonlighting" residents from other specialties who staff emergency departments on a part-time basis. The Modeling Panel estimated that there is likely to be close to 13,000 Full-Time Equivalent (FTE) emergency medicine physicians at the present time.

2. Documentation of the Manpower Requirements Calculation

As in each specialty studied, a Delphi Panel was selected for emergency medicine to provide advice on the application and implementation of an appropriate model to use in developing professional requirements for emergency medicine. The Emergency Medicine Panel consisted of 12 members; five of the members were emergency physicians (two academic, and three in practice), one family practitioner, one internist, one pediatrician, one psychiatrist, one trauma surgeon, one registered nurse, and one physician's assistant.

In determining manpower requirements, the emergency medicine utilization of the Delphi was in modified form (as was the utilization by the other specialties studied). The Delphi Panel was divided into two phases which took place during a single 2-day meeting. The first phase explored the subject being studied. The participants became acquainted with the model and reference data utilized as well as the tasks required of them. At this time too, the precise meanings of terms were clarified. The participants were then asked to individually complete their questionnaires and to return them to the staff for compilation. The second phase identified areas of agreement and disagreement among group members. An attempt was made to reduce variance in Panel estimates with the aim of inserting the consensus or median estimates into the model so that emergency medicine professional requirements could be derived.

Emergency Medicine Model--At the time the generic model was conceptualized, it was recognized that it would not be fully implementable by each specialty, but that a series of closely integrated models--one for each specialty--would be developed. Since the emergency physician delivers a great deal of nonurgent care, the extent of which is not identifiable by Eighth Revision International Classification of Diseases (ICDA), it was felt that the generic model needed to be amended for emergency medicine. The model developed for emergency medicine differs from the generic model in that current usage rather than epidemiological data is used as a starting point. Like the generic model which it parallels, the emergency medicine model uses the Delphi Panel to provide advice at each point or module of the process.

The emergency medicine model starts with the total number of emergency visits that should accrue to all emergency departments. This estimate is multiplied by the percent of these visits that should accrue to the emergency physician specialty, as opposed to other physician specialties, less the percent that should be delegated to the nonphysician provider and the non-emergency medicine resident who is rotating through the emergency department. The visits accruing to the emergency medicine team are all analyzed in terms of urgency classification and yield the adjusted emergency encounters accruing to the emergency physician per year. The number of outpatients treated by the average practicing emergency physician per week, taking into account nonpatient care activities, is then multiplied by the average number of weeks worked by the emergency physician to yield an estimate of the

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number of emergency room encounters per year per emergency physician. The adjusted number of all emergency room encounters that should accrue to the emergency physician specialty per year is then divided by the average practitioner's productivity figure to yield an emergency room patient care physician requirement. This requirement is adjusted to account for emergency physicians whose primary activities should be in areas other than direct patient care such as research, teaching, administration and disaster planning.

Table III.N.1 displays the steps of the requirements calculation based on the Emergency Medicine Delphi Panel responses. Table III.N.2 summarizes this output.

TABLE III.N.1

OUTPUT BASED ON
EMERGENCY MEDICINE DELPHI PANEL RESPONSES
(June 30, 1980)

1.	Emergent Visits per 100,000 Population Accruing to the Emergency Physician Specialty in 1990	3,920.00
2.	Urgent Visits per 100,000 Population Accruing to the Emergency Physician Specialty in 1990	17,842.50
3.	Nonurgent Visits per 100,000 Population Accruing to the Emergency Physician Specialty in 1990	6,300.00
4.	Total Visits per 100,000 Population Accruing to the Emergency Physician Specialty in 1990	28,062.50
5.	Total Predelegated Visits Accruing to the Emergency Physician Specialty in 1990 1/	68,335,836
6.	Percent of Emergent Visits Accruing to the Emergency Physician Team to be Delegated to the Physician Extender in 1990	0.0%
7.	Percent of Urgent Visits Accruing to the Emergency Physician Team to be Delegated to the Physician Extender in 1990	2.5%
8.	Percent of Nonurgent Visits Accruing to the Emergency Physician Team to be Delegated to the Physician Extender in 1990	22.5%
9.	Total Delegation to Physician Extender 2/	4,538,017
10.	Percent of Emergent Visits Accruing to the Emergency Physician Team to be Delegated to the Rotating Resident in 1990	0.1%
11.	Percent of Urgent Visits Accruing to the Emergency Physician Team to be Delegated to the Rotating Resident in 1990	2.0%
12.	Percent of Nonurgent Visits Accruing to the Emergency Physician Team to be Delegated to the Rotating Resident in 1990	5.0%
13.	Total Visits Delegation to Rotating Resident 3/	1,645,588
14	Total Postdelegated Visits Accruing to the Emergency Physician in 1990 4/	62,152,231
15.	Number of Emergency Department Visits per Week to be Managed by the Emergency Physician in 1990	100

TABLE III.N.1 (Continued)

16.	Number of Weeks per Year to be Worked by the Emergency Physician in 1990	46
17.	Number of Patient-care Emergency Physicians Required in 1990 5/	13,511
18.	Number of Hours per Week the Patient-care Emergency Physician Should Devote to Direct Patient-care in 1990	39.0
19.	Number of Hours per Week the Patient-care Emergency Physician Should Devote to Professional Duties Other Than Direct Patient-care in 1990	7.5
20.	Percent of Total Population of Emergency Physicians in 1990 Who Should Have a primary Activity in Areas Other Than Direct Patient-care	8.0%
21.	Add-on Number of Non-patient-care Emergency Physicians Required in 1990	1,175
22.	TOTAL NUMBER OF EMERGENCY PHYSICIANS REQUIRED IN 1990	14,686

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1. This estimate was derived by multiplying the total visits per 100,000 population accruing to the emergency physician specialty in 1990 (28,062.5) by the 1990 population factor of 2435.13. This population factor was provided by U.S. Department of Commerce, Bureau of the Census, Population Estimates and Projections, issued July 1977.

2. This estimate was derived by multiplying the number of emergent, urgent and nonurgent visits per 100,000 population accruing to the emergency physician by the appropriate percentages accruing to the physician extender and adding the products. The resultant figure was then multiplied by the 1990 population factor.

3. This estimate was derived by multiplying the number of emergent, urgent and nonurgent visits per 100,000 population accruing to the emergency physician by the appropriate percentages accruing to the rotating resident and adding the products. The resultant figure was then multiplied by the 1990 population factor.

4. The total delegation to the physician extender and the total delegation to the rotating resident were subtracted from the total predelegated visits accruing to the emergency physician specialty in 1990.

5. This estimate was derived by dividing the total postdelegated visits accruing to the emergency physician in 1990 by the product of the number of emergency department visits per week to be managed by the emergency physician in 1990 and the number of weeks to be worked per year by the physician in 1990.

TABLE III.N.2

SUMMARY OUTPUT BASED ON EMERGENCY MEDICINE DELPHI PANEL RESPONSES (June 30,1980)

1. Total Predelegated Visits Accruing to the Emergency Physician Specialty in 1990	68,335,836
2. Less Percent Delegation to Physician Extender	6.6%
3. Less Percent Delegation to Rotating Resident	2.4%
4. Total Postdelegated Visits Accruing to the Emergency Physician specialty in 1990	62,152,231
5. Emergency Physician Patient Visits per Year in 1990	4,600
6. Number of Patient-care Emergency Physicians Required in 1990	13,511
7. Add-on Number of Non-patient-care Emergency Physicians Required in 1990	1,175
TOTAL NUMBER OF EMERGENCY PHYSICIANS REQUIRED IN 1990	14,686

Emergency Department Visits Per 100,000 Population--The Emergency Medicine Delphi panelists were asked to estimate the current number of emergency department visits per 100,000 population in the United States. The American Hospital Association (AHA) estimate of 37,938 emergency department visits per 100,000 population in 1978 was overwhelmingly accepted by the Delphi Panel. Although the AHA statistics indicate an increase of approximately 1,000 emergency room visits per 100,000 population per year for the years 1974-1978, the Panel predicted no growth in the rate of visits per 100,000 population between 1978 and 1990 if GMENAC's recommendations are implemented and there is an adequate supply of office-based primary care physicians; the median Panel estimates of the number of emergent, urgent, and nonurgent visits per 100,000 population that will be seen in the emergency room in 1990 summed to 37,750.

Since much of the model required disaggregation of visits on an urgency basis, it was necessary for the Panel to define the parameters. The Panel agreed on the following urgency classifications: Emergent visits would be equivalent to critical cases; those which are life or limb threatening. Urgent visits were defined as those which are time related and which must be seen within 12 hours. The remainder of the emergency department visits were labeled Nonurgent.

The Panel was asked to estimate both the number of emergent, urgent, and nonurgent visits per 100,000 population that will accrue to the emergency department in 1990 if trends can be predicted, and the number that should accrue there assuming no access barriers to medical care. Thus, it is assumed that there will be enough physicians of all specialties available in all locations at all hours and that patients will be aware of their availability. As reference material, the Panel was given data from the Wisconsin Department of Health and Social Services 1975-76 study, the University of Southern California Emergency Physician Practice Study Report (1979), and the American College of Emergency Physicians (ACEP) Patient Urgency Study of 1980.

The Division of Health of the Wisconsin Department of Health and Social Services has provided the Office of Graduate Medical Education (OGME) with extensive emergency department encounter data for that State. The data result from a survey which was conducted in two quarters; December 1975 through February 1976 and September through November 1976. Despite its comprehensiveness, and its applicability nationwide after applying a conversion factor, the study had some limitations. The urgency classifications were not defined in terms of time. The Panel members may, then, have had difficulty in relating their definitions to the Wisconsin definitions. Another limitation of the Wisconsin study is that it excluded the summer months from its sampling time frame, a season which many members of the Panel felt was the busiest for the emergency department.

The University of Southern California School of Medicine has provided the office with data which establish the overall professional activity profile for the emergency physician in the Emergency Physician Practice Study Report which was based on a study conducted in May of 1978 under the direction of Robert C. Mendenhall, M.S. These data include a classification of the patient encounters by urgency classification. These classifications, however, like those in the Wisconsin data, were not defined in terms of time. Additionally, the sampling method of the Mendenhall Study has been criticized in some quarters.

The ACEP has also provided the office with data from their Patient Urgency Study. Although the urgency classifications in this study are not identical with the definitions adopted by the Delphi Panel, they were used by the Panel in their deliberations. The ACEP Study defined what the Panel considered emergent as "patients who need attention immediately (within minutes)." Urgent as defined by the Panel is described in the ACEP Study as patients who need attention within 1 to 12 hours. The nonurgent category represents the remainder of the emergency department visits in both the ACEP Study and the definitions adopted by the Panel. It should be noted that the percentages given in the study are the result of the physicians' initial, rather than retrospective, assessments.

The Panel predicted that in 1990 there will be a decrease in the proportion of nonurgent emergency room visits in response to economic demands. Emergency department care is very expensive because it is geared to the maximum need and will probably become increasingly expensive by 1990. The competition of the marketplace will, the Panel predicted, force primary care physicians to offer expanded hours of service. Both these factors will, the Panel thought, tend to decrease the proportion of nonurgent emergency department visits and consequently increase the proportion of emergent visits in 1990.

The Panel members were asked to consider their previous responses on the number of emergency department visits per 100,000 population that there will be in 1990 (37,750) and to estimate the number there should be in 1990, disaggregated by urgency classifications. This estimate was to be based on the assumption that there will be no access barriers to medical care due to physician supply of all specialties, time or geographic availability of these physicians, or patient education. The median number of emergent, urgent, and nonurgent visits per 100,000 population that should accrue to the emergency department summed to 32,800. This estimate was 13 percent less than the 37,750 that the Panel felt will occur if trends continue.

The results of the Panel's deliberations indicated marked increases in the emergent and urgent categories and an equally marked decrease in the nonurgent category when compared with the Wisconsin and Mendenhall data. They were, however, very close to the estimates provided in the ACEP data. These data are depicted in Table III.N.3. In addition, the percentages of nonurgent visits that should accrue to the emergency department were significantly less than the proportion that will occur, based on the Panel's estimate. This difference was counterbalanced by the proportions of urgent visits.

Table III.N.3

DELPHI PANEL'S RESPONSES TO URGENCY CLASSIFICATIONS AS COMPARED WITH REFERENCE DATA

DEGREE OF URGENCY	WISCONSIN DATA	MENDENHALL DATA	ACEP DATA	PANEL EST. 1990 (will)	PANEL EST. 1990 (should)
EMERGENT	2.8%	5.7%	12.6%	11.3%	12.2%
URGENT	22.8%	37.9%	54.4%	41.1%	55.8%
NONURGENT	61.5%	53.3%	33.0%	47.7%	32.0%
NO URGENCY GIVEN	12.8%	3.1%			
EMERGENT	Visits per 100,000 population			4,250	4,000
URGENT	Visits per 100,000 population			15,500	18,300
NONURGENT	Visits per 100,000 population			18,000	10,500
TOTAL VISITS PER 100,000 POPULATION				37,750	32,800

Visits Accruing to Emergency Physician Team--The Panel defined the emergency physician to include that individual with the unique skill of an emergency physician, whether or nor board-certified, staffing the emergency department on a full-time basis.

The next set of questions that the Emergency Medicine Panel addressed dealt with the emergency department visits accruing to the emergency physician team as opposed to the patient's personal physician. The Panel was given, as reference, data from the Wisconsin study which showed that 72.8 percent of the emergent, 71.3 percent of the urgent and 74.5 percent of the nonurgent visits to the emergency department were handled primarily by the emergency or on-call physician. The Panel felt that greater percentages of the emergent and urgent visits (98 percent) but smaller percentages of nonurgent visits (60 percent), should accrue to the emergency physician team.

Issues that were raised in discussion of these questions centered around the role of the private physician and the consulting specialist in the emergency department. Several of the non-emergency medicine physicians on the Panel believe that in 1990 more private physicians will be meeting their patients in the emergency department. They believe that the competition resulting from the oversupply of physicians in 1990 will require that the private physician offer this service. On the other hand, the emergency physicians on the Panel, observed that medically and legally they are responsible for every patient who presents at the emergency department and that unless the private physician were there waiting for the patient to arrive, the emergency physician would have to see at least the more urgent cases.

The Modeling Panel concurred with the Delphi Panel that competition resulting from the greater supply of physicians in 1990 will require the private physician offer expanded hours of service by keeping his office open for longer hours, or through the use of the 24-hour clinic. It thought, however, that the Delphi Panel underestimated the extent to which this greater supply will affect emergency department usage. The Modeling Panel predicted a greater decrease in the number of nonurgent emergency department visits per 100,000 population than did the Delphi Panel as well as a lowering of the urgent visits to the emergency department. The decreased usage of the emergency department will, the Modeling Panel thought, result in a small reduction of the 1990 emergency physician requirement from that derived from the Delphi Panel deliberations.

Delegated Visits--The Panel decided to treat delegation of emergency department visits to the physician extender separately from those delegated to the non-emergency medicine resident who rotates through the emergency department where the emergency physician has no "hands-on" contact. The Wisconsin reference data provided to the Panel did not include the physician extender as such. Rather, it included estimates for the registered nurse and "other professional". The Panel noted that while only teaching hospitals have residents and could thus accept a delegation to a rotating resident, physician extenders, on the other hand, might be used in a wider variety of situations. The Panel noted that a large emergency department that is busy enough to require the services of two emergency physicians at a time (25,000 to 30,000 visits per year) could effectively use a physician extender to reduce the patient load. For the emergency department in a rural area, however, there may not be enough emergency visits to justify the staffing of the emergency department with the services of even one emergency physician on duty around the clock on a cost effective basis. In such a situation, a physician extender might staff the emergency department for certain shifts and call the emergency physician at home when needed. There are also some hospitals with emergency medicine residents which use physician extenders to provide service instead of first year emergency medicine residents. There was a general agreement among the Panel members that when physician extenders are utilized by the emergency department, they are usually delegated the less serious cases. After addressing themselves to the issues described previously, most of the Panel concluded that no great expansion of the use of the physician extender is foreseen for emergency medicine.

The results of the Panel's deliberations indicated less willingness to delegate the emergent and urgent visits and a greater willingness to delegate the nonurgent visits when compared to the reference data. This is depicted in Table III.N.4.

Table III.N.4

DELPHI PANEL'S RESPONSES TO DELEGATED VISITS BY URGENCY CLASSIFICATION AS COMPARED TO REFERENCE DATA

	WISCONSIN DATA		DELPHI RESPONSE	
DEGREE OF URGENCY	DELEGATED TO REGISTERED NURSE	DELEGATED TO OTHER PROFESSSIONAL	DELEGATED TO PHYSICIAN EXTENDER	DELEGATED TO ROTATING RESIDENT
EMERGENT	2.4%	0.5%	0.0%	0.1%
URGENT	4.9%	0.9%	2.5%	2.0%
NONURGENT	4.3%	1.2%	22.5%	5.0%

Overall, the Panel felt that 6.5 percent of all emergency department visits should be delegated to the physician extender and an additional 2.4 percent should be delegated to the rotating resident.

Productivity--In discussing the productivity of the emergency physician, the Panel recognized that the emergency physician may have more down-time than the other physician specialties because of the discontinuity of patient flow. This would be reflected in a lowered number of patient contacts per week. The Mendenhall data which were provided for reference showed that, on the average, an emergency physician handled 103.2 emergency department visits per week. The Panel's median response to this question indicated that 100 emergency department visits per week should be handled in 1990 by the average practicing emergency department physician.

In considering the number of hours worked per week by the emergency physician, the Panel was given, as reference material, data from the Mendenhall study which showed that the average emergency physician works 41.0 hours per week, 81.9 percent of which is in direct patient care. The American College of Emergency Physicians Membership Survey of September 1979 showed that the average full-time emergency physician works 45 hours per week. The Panel indicated that 39 hours per week should be devoted to direct patient care by the emergency physician primarily involved in patient care in 1990. The Panel also indicated that the average emergency physician of 1990, who is primarily involved in patient care, should spend an additional 7.5 hours per week in other professional areas such as teaching, administration, research, and disaster planning.

The Panel next considered the number of weeks per year the emergency physician should work in 1990. Since emergency medicine is a new medical specialty, there are no reference data available on the number of weeks currently worked per year by the emergency physician. As reference material, Panel members were given the results of the other Delphi Panels that showed a median response of 46 weeks per year and responses from the 1976 AMA survey of other specialties which showed a median response of 47.0 weeks per year. The general consensus of the Panel to this question was that the emergency physician of 1990 should work 46 weeks per year.

The final question addressed by the Panel dealt with the percentage of the total 1990 population of emergency physicians that should be comprised of physicians whose primary activity is in areas other than direct patient care. Such emergency physicians are primarily involved in areas such as teaching, research, administration, and disaster planning. Since emergency medicine is in its infancy, the Panel initially predicted a great need for physicians involved in teaching and research in order to produce a sufficient supply of emergency physicians to meet unmet need. On the other hand, it was noted that this need must be constrained by the number of residency programs which are anticipated for 1990. At this time it is anticipated that there will be 100 emergency medicine residency programs in 1990. Another consideration addressed by the Panel is that emergency medicine, as a hospital-based specialty, has a greater need for administrators than may be true of other specialties. Although it was recognized that some of the patient-care emergency physician's down-time may be spent in areas such as teaching, administration, research, and disaster planning, certainly not all of it can be so used effectively. (It was pointed out that an emergency physician is not likely to be able to teach in the early morning hours if that is when he has some down-time.) Thus, not all down-time can be productively used to lower the need for emergency physicians not involved in direct patient care.

Two items of data were given the Panel as reference material for this question. Special tabulations of the AMA Master File in May 1979 showed the primary activity area of emergency physicians to be 96 percent direct patient care and 4 percent nonpatient care. The Panel was also told that the Delphi Panels for the other specialties showed an average of 7 percent for physicians not primarily involved in direct patient care. The Panel's median response to this question was that 8 percent of the total population of emergency physicians in 1990 should be primarily involved in professional activities other than direct patient care.

3. Modeling Panel Review of Emergency Medicine Delphi Panel Estimates

As shown in Tables III.N.1 and Table III.N.2 , the Delphi Panel's deliberations resulted in an estimated requirement of 14,686 emergency physicians in 1990. The Modeling Panel slightly reduced this estimate to between 13,000 and 14,000 as a result of the decreased usage of the emergency department which it perceives will occur by 1990.

The Modeling Panel felt that there is a significant undercount in the AMA supply data of emergency physicians. There are probably many other physician specialists who provide emergency care, as well as retired physicians and "moonlighting" residents from other specialties who staff emergency departments on a part-time basis. It was the opinion of the Modeling Panel that there is likely to be close to 13,000 FTE emergency medicine physicians at the present time. For this reason the Modeling Panel recommended that the number of emergency medicine residencies not be greatly augmented, but that the number of graduating residents be allowed to increase to 400 per year by 1983 and then be held constant at that number per year. Adding the number of graduating residents to the AMA base of 5,080 emergency medicine physicians in 1979 and applying an attrition factor results in an estimate of 8,922 emergency medicine physicians in 1990. Because of the other physicians rendering emergency medicine services noted previously, the Modeling Panel believed that the resulting 1990 supply at 8,922 represents a reasonable goal for formally trained emergency physicians. It noted that not all emergency departments can support a teaching program and that although it takes a minimum of 12,000 visits per year for an emergency department to be cost effective, a teaching program requires a minimum of 40,000 visits per year.

The Modeling Panel members noted that at the present time the emergency physician is providing a great deal of general nonurgent care for which they believe the emergency medicine resident is inadequately trained. The graduate emergency medicine resident typically has had only one year of training in nonemergency medicine inpatient rotations. This training is received either in a first postgraduate year or in the first year of a 3-year emergency medicine program. In the 49 percent of all

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emergency medicine residency programs offering a 3-year program, the first year is divided between 4 to 8 months in internal medicine and the remainder in pediatrics and surgery (all inpatient). The focus of this first year is on the disease process in a longitudinal state. The remaining 2 years of the 3-year program are identical with that of the 2-year program. The focus here is on the specialized skills required of the emergency physician. A minimum of 12 months are spent in clinical emergency medicine, 2 to 4 months are spent in critical care and the remaining 25-40 percent of the resident's time is spent in rotations through other departments where emphasis is always on learning the techniques and skills of the emergency physician.

The Modeling Panel estimated 1990 physician manpower requirements for physicians providing emergency care between 13,000 and 14,000. In endorsing this estimate, GMENAC cautioned that although there is an undersupply of emergency physicians at the present time, care must be taken to ensure that an oversupply does not develop in training residents to meet the 1990 requirements. GMENAC or its successor should carefully monitor the development of the specialty in the coming decade.

O. PREVENTIVE MEDICINE

1. Overview

The specialty of preventive medicine is, in reality, four separate special areas of concentration with a common orientation; namely, the health of groups of persons or defined populations. The four areas are: Aerospace medicine, general preventive medicine, public health, and occupational medicine.

Certification can be obtained in one or more of the special areas, but not in the overall field of preventive medicine. Thus, at present, physicians seeking board certification sit for 2 days of examination. On the first day, applicants for certification in all four special areas take the same examination. On the second day, applicants sit for the examination in the special area in which they seek certification. If certification in a second special area is sought, only the second-day examination in the second special area is required in addition to the 2 days of testing for certification in the first special area. Beginning in 1981, however, it is anticipated that examinations for board certification in general preventive medicine and public health will be combined into a single examination.

According to the AMA Physician Masterfile, there were approximately 6,000 specialists in preventive medicine in December 1978, of which about half were practicing in public health or general preventive medicine. (The total includes approximately 160 residents.) Less than half of these are board certified, however, since it is quite common for practitioners to enter the field at midcareer without returning for additional postgraduate training. (Indeed, this fact complicates the projection of supply of practitioners.)

The need for greater methodological development and adequate data was obvious throughout the preparation for and the actual process of modeling manpower needs in this specialty.

2. Delphi Panel Need Estimates

Manpower needs in preventive medicine were particularly difficult to measure, since needs in the specialty cannot be modeled on a disease category specific basis. Consequently, the Delphi Panel chose to model needs directly on the basis of types of service provided. Five service areas were agreed upon:

- Program planning, operation, administration, evaluation, etc.
- Research;
- Teaching;
- Clinical services, i.e., the direct care of individual patients; and
- Other

Manpower needs to provide each of these services were estimated on a special area specific basis, although the areas of public health and general preventive medicine were combined, on the basis of the anticipated convergence in their postgraduate training.

The estimates of manpower requirements were established in two steps. First, the relative distribution of manpower over the various services was established for each area by examining the current percentage distribution of services and adjusting it to what the 1990 distribution should be in light of expected changes (as listed on a succeeding page of this section). Second, the absolute level of manpower requirements was established.

The relative levels of activity over the service categories for each special area are shown in Table III.O.1. As can be seen there, two distinct service profiles were estimated for occupational health. The first column of percentages is the professional profile which emerges from an estimate based on an absolute minimum requirement for clinical services in occupational medicine, whereas the second column is based on an estimate for a target requirement for clinical services. The minimum figure was suggested because of the feeling that the target would be unreachable by 1990. As will be discussed, the provision of clinical services by specialists in preventive medicine was an issue which the Modeling Panel also addressed.

Table III.O.1

PERCENTAGE OF TOTAL PROFESSIONAL ACTIVITIES OF PREVENTIVE MEDICINE SPECIAL AREAS TO BE DEVOTED TO DIFFERENT FUNCTIONS IN 1990

Function	Aerospace Medicine	Occupational Medicine*		Public Health and General Preventive Medicine
		Minimum	Target	
Program Activities	26%	61%	36%	59%
Research	16	9	5	11
Teaching	6	13	8	13
Clinical Services	52	17	51	11
Other	0	0	0	6
TOTAL	100	100	100	100

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*See text for explanation of dual estimates for occupational medicine.

Absolute manpower requirements were estimated by considering current manpower levels, the capacity of the training system to produce new additions to the supply and expected changes in the service areas. Among these latter are:

- In aerospace medicine--increased air passenger miles, increased recreational flying, a shift from horizontal to vertical/stratospheric flight, developments resulting from the expected success of the space shuttle, the need to keep abreast of European research efforts, passage of the Air Ambulance Act;

- In occupational medicine--implementation of recently passed legislation mandating expanded occupational safety and health programs in the workplace, increased attention to environmental monitoring and toxic waste disposal, expansion of clinical services to a "captive" audience by industry, "on-site" generalist clinical functions to be provided largely by generalist physicians and nonphysician providers; and

- In public health-general preventive medicine--a shift to nonphysician governmental health officers at the top of the hierarchy, a shift to regional rather than local public health activity, a shift in estimate from 1 public health physician per 40,000 people to 1 per 100,000, an increased awareness of the need to provide more preventive medicine training in the medical school curriculum, thus a need for more teachers in the schools of medicine, an increased attention to environmental monitoring, the public health implications of an aging population, and an increase in wellness institutes and the provision of care by general preventive medicine specialists

Based on these considerations, the Panel estimated the 1990 manpower needs shown in Table III.O.2.

Table III.O.2

DELPHI PANEL ESTIMATES OF 1990 MANPOWER NEEDS IN PREVENTIVE MEDICINE

Activity	Aerospace Medicine	Occupational Medicine	Public Health and General Preventive Medicine	Preventive Medicine Total
Program Activities	250	1,400	2,100	3,750
Research	150	200	400	750
Teaching	60	300	450	810
Clinical Services	500	400/2,000*	400	1,300/2,900
Other	0	0	200	200
TOTAL	960	2,300/3,900	3,550	6,810/8,410

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* The lower figure is an absolute minimum requirement, the larger figure is a target requirement.

3. Modeling Panel and Committee Review

The central issue the Modeling Panel addressed was the provision of clinical (individual patient care) services by the special areas of occupational medicine and public health/general preventive medicine. If the clinical services being provided by preventive medicine are for disease categories already modeled in the adult care and other specialty panels, to include them again here would result in double counting of manpower requirements. In other words, the adult care and other panels estimated total service needs without regard to setting. Simply because care is provided in an occupational or public health setting does not by itself generate any new manpower requirements. At the same time, if the clinical service requirements estimated by the Preventive Medicine Delphi Panel are for services not previously considered by the other specialty panels, then additional manpower requirements will be implied.

It was the sense of the Modeling Panel that, with the exception of aerospace medicine, the clinical services provided in occupational and public health settings are the same services already accounted for by the Adult Care Panel, and hence, no additional manpower is required. The remainder of the Delphi Panel estimates were accepted. Therefore, the Modeling Panel estimated the requirements shown in Table III.O.3. The total implied requirements in Table III.O.3 sum to just over 6,000 FTEs, and the Modeling Panel estimated 6,000-7,000 Preventive Medicine specialists to be needed in 1990.

Table III.O.3

MODELING PANEL ESTIMATES OF 1990 MANPOWER NEEDS
IN PREVENTIVE MEDICINE

Activity	Aerospace Medicine	Occupational Medicine	Public Health and General Preventive Medicine	Preventive Medicine Total
Program Activities	250	1,400	2,100	3,750
Research	150	200	400	750
Teaching	60	300	450	810
Clinical Services	500	---	---	500
Other	0	0	200	200
TOTAL	960	1,900	3,150	6,010

The Committee reviewed the Modeling Panel's estimates, again focusing on the issue of clinical services. After further discussion of the issue, including presentations by specialists in preventive medicine, the Committee decided that, in fact, some of the clinical services provided in occupational and public health settings are special services not accounted for by other specialty panels. Consequently, the Committee adopted the 1990 needs estimate of 6,800-7,800 preventive medicine specialists, based on the requirements shown in Table III.O.4.

Table III.O.4

COMMITTEE RECOMMENDATIONS FOR 1990 MANPOWER NEEDS IN PREVENTIVE MEDICINE

Present Supply	Aerospace Medicine	Occupational Medicine	Public Health and General Preventive Medicine	Preventive Medicine Total
Program Activities	250	1,400	2,100	3,750
Research	150	200	400	750
Teaching	60	300	450	810
Clinical Services	500	400	400	1,300
Other	0	0	200	200
TOTAL	960	2,300	3,550	6,810

P. PSYCHIATRY

Psychiatry professional requirements are influenced by a multitude of factors ranging from mental illness needs to the unique practice profiles of psychiatrists. Complicating the issue is the problematic situation that psychiatry now faces in maintaining--let alone increasing--a supply of practitioners adequate to meet population as well as facility-specific needs.

Currently, estimates on the rate of mental illness range from a low of 10 percent (which as a prevalence estimate does not include the incidence of new illness) to a high of over 23 percent (Srole, et al., 1978). Since the former figure underestimates the total rate and the latter estimate utilizes a broad definition of illness; (i.e., the presence of marked, severe or incapacitating symptoms associated with behavioral or intrapsychic functioning) most sources, including the President's Commission on Mental Health (PCMH) accept an estimate closer to 15 percent of the population as being in need of some type of mental health intervention (President's Commission on Mental Health, 1978). Of the approximately 15 percent estimated to be in need of mental health care and/or treatment, over 21 percent are not in treatment or are seen in the human services sector. Only 21 percent receive treatment from the specialty mental health sector (6 percent of these overlap with the primary care/general health sector). (Regier, et al., 1978).

Coupled with the large need for mental health intervention is the growing shortage of psychiatrists in the country to provide for the need. Recently, declines in the numbers of foreign medical graduates (FMGs) and American medical graduates (AMGs) who are entering psychiatry residencies have led to the production of fewer psychiatrists, thus intensifying any future shortages.

Foreign medical graduates have been integral to the staffing of State and county mental hospitals and represent the great majority of the residents in these facilities. In 1974-5, 39 percent of psychiatric residents were FMGs. At the same time, 57 percent of the full-time physician staff and 60 percent of residents in State and county mental hospitals were FMGs (Jenkins and Witkin, 1976). Although a decline in FMGs in psychiatry began prior to the first full year enactment of the Health Professions Educational Assistance Act of 1976 (P.L. 94-484), it can be expected that further declines in the supply of FMGs will continue due to the stringent guidelines contained in P.L. 94-484 which restrict the preferential treatment of FMGs by controlling student visas and requiring that FMGs pass a National Board of Medical Examiner's examination and competency exams in English before entering the country. In addition, upon residency completion, FMGs must leave the country unless they have permanent visas.

American medical graduates are also affecting the supply of psychiatrists. In 1970, 12 percent of these graduates chose to enter psychiatry, while in 1976 only 6 percent did. (Liptzin, December 1979). In the future this is expected to decrease even further as evidenced by a 28 percent decline in the number of people taking premedical school admission tests who expressed an interest in specializing in psychiatry, the greatest decrease of any specialty (Gordon, 1979). Furthermore, the Association of American Medical Colleges (AAMC) 1979 Medical Student Graduation Questionnaire Survey, which had a return rate of 55 percent, indicates only 3.6 percent planned a residency in psychiatry. Importantly, not only has the relative percentage of medical students entering psychiatry decreased, but the absolute number of first-year residents has dropped (particularly U.S. students) according to the American Medical Association (AMA).

Many reasons lie behind the decreasing interest of AMGs in psychiatry. Students who enter psychiatry often switch to primary care since many feel that psychiatry does not utilize the full range of medical skills (Neilson, August 1979). There has also been a lessening in enthusiasm for the "promises of approaches to potential solutions for a panorama of problems" (Pardes, June 1979). Furthermore, many students interested in psychiatry pursue careers in primary care due to the renewed attractiveness of primary care and the activities encouraging them to enter primary care careers stemming from P.L. 94-484.

In addition there has been a lack of financial incentives in psychiatry. Salaries of psychiatrists have been the lowest among medical professions since 1971; while other medical professions income rose by 5.2 percent from 1969 to 1974, that of psychiatrists rose by only 3.4 percent (Rheinhardt, 1975). This tendency may be linked to reimbursement mechanisms which do not favor time intensive practices such as those of the psychiatrist, as opposed to practices that are procedure focused (medical and surgical subspecialties) as well more favorable reimbursement policies for general medical and inpatient care as opposed to ambulatory and mental health care.

Lastly, the decline in students entering psychiatry residencies has been linked to a multitude of factors originating in medical schools. Delphi panelists pointed to the low priority given psychiatry in medical schools and the negative impressions of the field given students by professors of other medical specialties. Consequently, this combined with the above reasons, has resulted in a 20 percent decrease of students entering psychiatry residencies from 1970 to 1976, according to the AMA.

Further problems faced by the field of psychiatry focus upon the current supply distribution by geographic region and treatment sector. Currently, slightly less than one-half of all psychiatrists are located in five States and the District of Columbia. The AMA and the American Psychiatric Association (APA) estimate that between 48 and 49 percent of all psychiatrists locate in these areas. However, these areas house between 29 and 32 percent of the population. This type of maldistribution is not unique to psychiatry or to other professions, such as law. Furthermore, the distribution problem is clouded by many factors. For example, psychiatrists locate around areas in which public facilities exist since a large portion of their activities is directed toward public practice.

The staffing problems in State and county mental hospitals are related to the decline in FMGs as well as to factors related to shortfalls in the number of psychiatrists generally, and to particular problems related to those types of facilities. Community Mental Health Centers (CMHCs) also face a crisis. While there has been an increase in the absolute number of FTE psychiatrists employed in CMHCs since 1968, the average number of psychiatrists per center has decreased between 1970-1977; in 1977 only 4.7 percent of CMHC's FTE staffs were psychiatrists. (Provisional Data on CMHC, 1977).

Psychiatry has several unique features which contributed to modifications in the existing GMENAC model for estimating physician professional requirements.

The professional requirements in psychiatry were developed for the average psychiatrist and not the average psychiatrist involved in the provision of patient care. Delphi panelists chose the above approach previously described since a large percentage of a psychiatrist's time is involved in teaching and administrative services in public mental health agencies. According to the AMA Survey of 1977, 19 percent of psychiatrists were primarily involved in nonpatient care activities. The following breakdowns were observed across the various activities by two sets of surveys (APA, 1970 and NIMH, 1976):

Percent of Time in Activity
by all Psychiatrists

Type of Activity	1970 APA Study	1972 NIMH Study
Direct Patient Contact or Clinical Services	64	59
Consultation	9	6
Supervision and/or Training	NA	13
Teaching	8	5
Research	4	5
Administration	15	11
Other	NA	1
Total N	13,006	1,500

Secondly, psychiatry panels did not utilize the commonly used International Classification of Diseases, Adapted for Use in the United States, (ICDA) approach for determining conditions under their purview but instead adopted a combination of the ICDA and Diagnostic and Statistical Manual of Mental Disorders, Third Edition, (DSM-III) classifications.

While other Delphi panels divided service requirements into those occurring in ambulatory and hospital settings, the psychiatry panels delineated four discrete treatment settings. Furthermore, rather than estimating the norms of care based on the "number of visits," panelists based their norms on the average number of discrete units of time required for each case per year or per day of stay within an acute hospital setting; with each unit equalling one 15-minute time interval.

Moreover, the roles of nonphysician providers in psychiatry differ from those of the physician assistant and nurse practitioner who traditionally practice directly with and/or under the supervision of the physician in other medical specialties. In contrast, clinical psychologists, psychiatric social workers, clinical specialists in psychiatric nursing, and some other providers may be licensed and practice verbal therapies independently of psychiatrists. Because of this relationship, the issue of task and visit delegation is obscured. Hence, panelists chose to calculate requirements solely on the basis of care which needed to be provided only by psychiatrists.

Lastly, because of the unique issues surrounding child mental health care, the size of the population served, the different role sharing with other specialties, and the potential role of child psychiatry for the prevention of mental illness, it was decided to convene a separate panel to estimate requirements for child psychiatrists.

The next section addresses general psychiatry, encompassing care for those age 18 and older, and the succeeding section deals with child psychiatry, subsuming care for those under age 18.

GENERAL PSYCHIATRY

1. Overview

In order to determine physician requirements in general psychiatry a panel of 12 members was convened for two sessions of meetings. The panel was comprised of five general psychiatrists, one child psychiatrist, one pediatrician, one general internist, one family practitioner, one clinical psychologist, one psychiatric nurse and one psychiatric social worker.

2. Documentation of the Manpower Requirements Calculation

One of the major problems facing the psychiatry panels was the determination of the prevalence of mental disorders, the first step in the GMENAC needs-based approach for estimating manpower requirements.

Mental illness data collection and analysis are fraught with many of the same difficulties as in health care, generally. In addition, there are a number of problems specific to the mental health field. At the root of many of the problems is the lack of a clearly agreed upon definition of precisely what constitutes mental illness. The problem is further compounded by the difficulty in reliably measuring particular mental illnesses across various studies and observers. In addition, there is a dearth of recent large-scale community surveys as well as longitudinal studies in the area. While data from the National Institute of Mental Health (NIMH) and other sources were presented to the panelists as reference material, differences in the levels of aggregation of data as well as differences in the classificatory schemes adopted in various studies, inhibited comparisons among the various sources of data. In the future, due to the development of the Diagnostic and Statistical Manual-Third Edition (DSM-III), the construction of new instruments for measuring mental disorders, and the planning for future longitudinal studies, such analytical problems will be minimized.

The diagnostic classification scheme also posed difficulties. It is difficult to classify psychiatric illness by etiology due in part to the intricate web of social, psychological, economic, and environmental as well as biological factors involved. As such, it has been difficult to develop a single system for classifying mental disorders that is uniformly used and accepted. The panel did not feel that the ICDA (which incorporated the older DSM II) alone represented a schema disaggregated and specific enough for their purposes.

Because of the considerations just described, panelists opted for a unique approach for classifying requirements estimates. The approach chosen by them, a combination of the ICDA and DSM-III schemes, while facilitating the work of the panel did, however, complicate comparisons with other medical specialties and with the child psychiatry panel which opted for an even different classification scheme.

The following classificatory schema was adopted by panelists:

(1) Schizophrenia and Other Psychoses - ICDAs 295, 297, 298.1-298.3, 298.8, 299

(2) Affective Disorders - includes psychotic and neurotic depressions and manic depressions - ICDAs 298.0, 296, 300.4

(3) Neuroses and Personality and Character Disorders - including behavioral disturbances - ICDA 300 NEC

(4) Alcohol Disorders - Only those alcoholics who need psychiatric treatment were included in this category. This recognizes that many alcoholics function without such need. (Alcoholics Anonymous services are not included in this category.) - ICDAs 291, 303, 309.13

(5) Drug Disorders - As above, this includes only those who need psychiatric treatment. - ICDAs 294.3, 304, 309.14

(6) Mental Retardation - all types - ICDAs 310-315

(7) Organic Brain Syndromes - ICDAs 290, 292-294, 309 NEC

(8) Other - including physical disorders of presumably psychogenic origins, transient situational disturbances, sexual and marital dysfunction, etc. - All else.

Upon choosing their classificatory schema, panelists decided to differentiate requirements for specific diagnoses by first estimating an overall prevalence rate for mental illness of 18 percent of the adult population and then calculating the prevalence of specific conditions on the basis of their known distribution in the population. The prime reason for the choice of an 18 percent figure was that the recent President's Commission on Mental Health (PCMH) reported a rate of 15 percent which NIMH considered to be conservative as an annual rate, and that more liberal estimates hovered around 23 percent. Eighteen percent is midway between the high and low estimates. The following prevalence estimates were obtained from this procedure:

Conditions	1990 Rate per 100,000 Adult Population
Schizophrenia and Other Psychoses	1,000
Affective Disorder Psychoses	1,000
Affective Disorder Neuroses	5,000
Neuroses and Personality Disorders	5,000
Alcohol Addiction	2,000
Drug Abuse	500
Mental Retardation	1,500
Organic Brain Syndrome	1,000
Other	1,000
TOTAL	18,000

The estimates are comparable to those cited in other sources. The Task Panel on the Nature and Scope of the Problems for the President's Commission on Mental Health stated that presently there are approximately 2 million schizophrenics in the population as well as 2 million persons with affective disorder psychoses and over 1 million with organic brain syndromes (PCMH Vol. II, 1978). The rate for organic brain syndrome in 1990 was increased by panelists due to the changing age composition of the population.

Of the estimated 18 percent of the adult population affected with mental disorders, the Delphi panel estimated that only two-thirds or nearly 12 percent of the population requires some type of mental health intervention. Compared to the 15 percent figure adopted by the PCMH, the Delphi panel's estimates are quite conservative.

Recognizing that care for the 12 percent of mental disorders could not neatly be divided between the ambulatory and hospital sectors, the panel then delineated four different care settings.

(1) Chronic Institutional - includes intermediate care facilities for the mentally retarded, nursing homes, and State and county mental hospitals, but not prisons. Care by psychiatric residents as well as psychiatrists is included here; however, the panel considered resident input to have only minimal impact on manpower requirements.

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(2) Acute Hospitalization - includes all short stay beds in acute as well as State and county hospitals and also freestanding detoxification units.

(3) Partial Hospitalization - halfway houses, group homes, day care centers, boarding homes, foster homes, and congregate care facilities are included here.

(4) Ambulatory - prison care included here, as well as private practices, community mental health centers, outpatient psychiatric services of general and psychiatric hospitals, and freestanding outpatient clinics.

There is overlap in the above categories, with the exception of (1) and (4), in that the same patient may be seen in more than one setting. For example, a patient may spend time in an acute hospital setting and then receive ambulatory care or partial care.

Once determining prevalence rates for the chosen diagnostic categories and treatment settings, the panel proceeded systematically to determine what percentage of those with various diagnoses should require care by psychiatrists in the specifically designated settings.

Recognizing the self-limiting nature of many mental disorders and the large role played by nonphysician providers and other physicians, particularly primary care physicians, treatment by psychiatrists was very broadly defined as any activity performed on behalf of a particular patient with a particular diagnosis; therefore it includes direct as well as indirect patient care activities (e.g., consultation with other providers regarding a specific patient).

Across all treatment settings, the General Psychiatry Delphi panel recommended that only 25 percent of persons requiring mental health intervention need to see a psychiatrist. This approximates 3 percent of the adult U. S. population. Currently, 3 percent of the entire population receives treatment from the specialty mental health sector, which includes care provided by all mental health professions (Regier, et al., 1978).

For the 3 percent of the population estimated in need of psychiatric intervention the role of the psychiatrist was determined in a conservative fashion. For example, the panel estimated that for the majority of mental illness morbidities requiring care by a psychiatrist, approximately 6 average hours of care should be provided by the psychiatrist annually. Similarly, for the majority of patients in an acute hospital setting, panel members felt that only between one-half of an hour and 1 hour of care should be provided per day; except for psychoses. The average length of stay in an acute setting per patient was estimated to be less than 1 week.

Although conservative in their estimations on the required role of the psychiatrist in the provision of mental health care, panelists were told to assume that no barriers would exist that would limit the provision of adequate care for people in need; thus not considering such limiting barriers as financial resources, reimbursement policies, personnel resources, the stigma of mental illness and mental health care, etc. Furthermore, they projected that psychiatric care should be primarily devoted to persons suffering from more severe conditions. A percentage breakdown of the psychiatric service requirements by condition follows.

Conditions	Percentage Each Condition Contributes to Total Service Requirements
Schzophrenia and Psychoses	29.6
Affective Disorder Psychoses	27.5
Affective Disorder Neuroses	11.8
Neuroses and Personality Disorders	9.0
Alcohol Addiction	4.4
Drug Abuse	1.0
Mental Retardation	2.2
Organic Brain Syndrome	6.4
Other	8.1
TOTAL	100.0

As one can observe in the preceding table, over 63 percent of a psychiatrist's service requirements were estimated to be devoted to the care of psychoses and organic brain syndrome. According to Marmor, at least for private practice psychiatrists, patients with schizophrenia and the other more severe disorders do not presently constitute as large a part of the psychiatrist's practice as the panel projected. (Marmor, 1975.)

Across the four treatment settings delineated by the Delphi panel, it was determined that the majority of psychiatric care should take place in the ambulatory setting. Approximately 57 percent of the average psychiatrist's patient care activities were allocated for ambulatory care, whereas respective figures for the partial hospital setting, acute hospital setting, and chronic institutional setting are: 7.1 percent, 31.5 percent and 4.2 percent. As indicated earlier, utilizing the average psychiatrist implicitly includes requirements for teaching, research, and administration.

In order to convert psychiatric service requirements into the number of psychiatrists needed in 1990, panel members had to develop productivity estimates for psychiatrists, in terms of the number of 15-minute units of time devoted to the care of a particular patient. In calculating time spent in patient care activities, panelists included three-fourths of their consultant time which totals slightly over 4 hours weekly. The average psychiatrist was estimated to work 33.5 hours weekly in patient care for 46 weeks per year. Since norms of care were provided in terms of the number of 15-minute units of time devoted to a patient, the total productivity of a general psychiatrist in terms of service units equals 6,164 units per year (33.5 hours x 4 15-minute units of care per hour x 46 weeks per year in practice = 6,164 units of care per year).

Dividing the estimated service requirements by the productivity of the average general psychiatrist yields a need for nearly 40,000 general psychiatrists. However, since general psychiatrists do provide care for children and child psychiatrists do provide care for adults, a correction factor had to be developed to account for these components. The General Psychiatry Delphi panel estimated that 12.5 percent of their service units calculated for adults are provided to children. Coupling this with the 15 percent of adult care that child psychiatrists are estimated to provide yields a need for over 43,000 general psychiatrists.

Lastly, it should be noted that the General Psychiatry Delphi panel did not feel that their estimates on the need for general psychiatrists need be further corrected to account for simultaneity across conditions and the impact of group therapy on their practices, since these are of minimal magnitude and have been taken into consideration in the development of the panel's conservative estimates.

3. Modeling Panel Review of General Psychiatry Delphi Panel Estimates

The Modeling Panel of GMENAC reviewed the data emanating from the general psychiatry delphi panel and suggested that two specific changes be made. For conditions in the "other" category of the Delphi panel (e.g., transient situational disturbances etc.), the Modeling Panel recommended that the ambulatory units of care be reduced from 52 to 24, in line with these for other conditions in the ambulatory setting. Secondly, the Modeling Panel recommended that the total hours devoted to patient care activities be increased from 33.5 hours per week to 36 hours per week. As a consequence, the total productivity of the average psychiatrist increases from 6,164 annual units to 6,624 units.

GMENAC reviewed and accepted the changes suggested by the Modeling Panel. Consequently, the total number of general psychiatrists required for 1990 decreases from over 43,000 to approximately 38,890. Due to a margin of error in calculating the need for general psychiatrists, the Modeling Panel further recommended that a range be accepted of 37,000 to 40,000 general psychiatrists for 1990.

CHILD PSYCHIATRY

1. Overview

The determination of requirements for child psychiatry were developed by a group of experts in the field who met for one session and then communicated by mail and phone. On the panel were four child psychiatrists, two pediatricians, and one child psychologist.

2. Documentation of the Manpower Requirements Calculation

While the Child Psychiatry panel basically adopted intact the format for estimating requirements used by the General Psychiatry panel, several modifications described below were made:

The panel chose the following diagnostic conditions:

(1) Mental Retardation - Because mental retardation is a discrete category where epidemiological data are available and because the condition is easily diagnosed, it was decided to use the common definition of mental retardation as an IQ of 70 and below.

(2) Psychoses and Severe Disturbances - This category includes all of ICDAs 294 and 295, and 293.3-293.9.

(3) Affective Disorders (Psychoses and Nonpsychoses) - The Child Psychiatry panel, like the General Psychiatry panel, split affective disorder psychoses from the psychoses in the category above but decided to expand the General Psychiatry panel's definition of affective disorder neuroses to include all affective disorders which were nonpsychotic. The Child Psychiatry panel did acknowledge the possibility of overlap betweeen this latter category and the transient depressions so took special care not to double count patients with these diagnoses.

(4) Neuroses, Personality/Character Disorders, and Behavior/Conduct Disorders - This category was made more explicit by delineating three basic components. Neuroses encompasses all neuroses with the exception of the neurotic depressions which are subsumed in the above category. School phobias are contained here as well as alcohol and drug problems which were treated as separate entities by the general panel. The subgroup of behavior/conduct problems represents a compromise between the DSM II (behavior) and III (conduct) classifications.

(5) Emotional problems associated with neurological and perceptual problems and psychophysiological problems - This category includes all those diagnoses associated with physicial symptoms and therefore enables other medical specialties to identify clearly with conditions in this category with which they also come in frequent contact. Anorexia nervosa is contained here. Also included are all children with developmental disabilities (excluding autism which is in the psychoses category) and/or the deaf, blind, epileptic, and those with other chronic illness, some of whom can benefit from some mental health intervention.

(6) Other - This includes the reactive and situational disorders (transient situational and transient developmental deviations, for example). Custody cases are encompassed in this category as are children referred for a mental health assessment who are evaluated by mental health professionals as normal. Well child assessments are also included.

Besides altering the diagnostic classificatory schema adopted by the General Psychiatry panel, the Child Psychiatry panel slightly altered the treatment settings on which they based their estimates. The term "partial care" was changed to "special community care programs" because the concept of partial care was considered to have little significance for children who usually live at home while participating in group programs. This new category includes partial hospitalization, special education programs, group foster homes, sheltered workshops, etc.

After choosing appropriate diagnostic categories, the Child Psychiatry panel determined prevalence rates. Initially, they estimated that 17.1 percent of children are in need of mental health care and approximately 5.4 percent of children should see a child psychiatrist. While this may at first seem excessive when compared with the General Psychiatry panel which estimated that 12.1 percent of adults should receive treatment for mental disorders and 3 percent of adults should see a psychiatrist, it should be emphasized that this subgroup felt that child needs differ from those of the adult by virtue of numerous factors. Children's problems are seen to be more pervasive since their total environment (home, school) is impacted when there is a problem in one area.

Furthermore, the Child Psychiatry Delphi panel was conservative in estimating that the psychiatrist should see nearly all children with psychoses and those in hospital settings, but only approximately 25 percent of children with neuroses, personality disorders and other nonpsychotic mental illnesses. The remainder would be seen by primary care physicians, pediatricians and other mental health care professionals. The reasoning behind this is that the psychiatrist has unique biologic, neurologic and psychosocial skills which are important in the provision of care for the more severely ill.

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In developing service requirements for children, the Child Psychiatry panel estimated that the norms of care for psychoses should be substantially higher than for nonpsychotic conditions. The greatest number of units of care per patient were allocated for chronic institutional care, an area in which care is presently deficient.

Stemming from the Child Psychiatry panel's initial deliberations, the following distribution of service requirements in 1990 is observed at an aggregated condition level:

Condition	Percentage of Service Requirements to Psychiatrist
Psychoses	41.0
Neuroses, et al.	57.2
Mental Retardation	1.8

Thus, although, the role of the child psychiatrist is more pronounced in the treatment of psychoses, a larger portion of the service requirements for children is comprised of the neuroses et al. category, since the majority of children with mental disturbances were estimated to fall into this category.

Across treatment settings the majority of care provided by child psychiatrists, as for general psychiatrists, should occur in the ambulatory setting, followed in order by the acute hospital, chronic institutional, and partial hospital settings. Respective percentages of services required in these settings are: 72.2 percent, 17.4 percent, 8.1 percent and 2.3 percent.

The conversion of service requirements into total professionals, as in the case of adult care, was dependent upon the development of a productivity estimate for the average child psychiatrist. Initally, panelists estimated that the child psychiatrist would spend 30 hours weekly in patient care for 46 weeks per year. It is important to note that the Child Psychiatry panel felt that child psychiatrists must devote more time to nonface-to-face patient care activities such as school or juvenile justice system consultation and conferences, than do general psychiatrists. Employing the same calculation as was done for adults, a total of 5,520 average annual units of care would be performed by a child psychiatrist in 1990. (30 hours x four 15-minute units of care per hour x 46 weeks of activity per year = 5,520 annual units). This was later increased by panelists to 6,624 units upon increasing patient care time to 36 hours per week.

Without correcting for the care provided adults by child psychiatrists and the care general psychiatrists provide children, a total of over 26,100 child psychiatrists were estimated to be needed for 1990. The Child Psychiatry panel, as the Adult Psychiatry panel, did not feel that group therapy would impact upon these requirements in 1990. Members of the panel felt that the majority of group therapy will be provided by nonpsychiatrists and that the minor role played by psychiatrists in these efforts was already considered in the total norms of care estimated for all conditions and settings. Since their prevalence estimates and norms of care were thought by them to be conservative estimates of need, they further felt that any minimal amount of simultaneity which may exist would not change the requirements significantly.

As with the general psychiatry estimates it was necessary to correct for that percentage of care that child psychiatrists should devote to adult care. Panelists estimated this to be 15 percent of the service norms for children in 1990. Adjustments were also made for the percentage of child care which is provided by general psychiatrists. As a consequence of this correction, the total number of child psychiatrists required for 1990 decreased to approximately 25,000.

3. Modeling Panel Review of Child Psychiatry Delphi Panel Estimates

Data from the Child Psychiatry Delphi panel were then presented to the Modeling Panel of GMENAC for review. The Modeling Panel reviewed the data along with modifications suggested by a Delphi panel member. Consequently, the Modeling Panel made several adjustments to the Child Psychiatry Delphi panel data. For psychoses, the prevalence rate was decreased from 1,100 per 100,000 children to 750, more in line with a "best estimate" produced by the NIMH. Similarly, norms of care in the ambulatory and special program categories were respectively decreased from 72 and 24 to 60 and 20 to reduce some of the disparity between the child and adult norms of care for similar conditions (although for reasons discussed earlier, it was felt that children's care did generally require more time than that required of an adult with a similar condition). The prevalence of neuroses, behavior/conduct disorders, psychophysiological and physical conditions et al. was also decreased from 32 to 22 percent, more similar to estimates on the prevalence of such conditions obtained through the NIMH. In addition, the Modeling Panel further reduced the percent of children with these conditions who should seek care from 48.4 percent to 33.5. The rationale behind this decision focused on the self-limiting nature of some of these conditions, the existence of the natural support systems of the family, school, etc. which are very important in the care for all these children, and the lack of capacity to train adequate numbers of professionals to treat the large unmet need by 1990.

As a consequence of the Modeling Panel's revisions, only 8.6 percent of children were felt should require professional help as compared to the initial estimate of 17 percent. Secondly, only 3 percent of children were estimated in need of and able to be served by psychiatric professional care. Originally the Delphi panel estimated that over 5 percent of children were in need of such care.

Applying the preceding changes to the child psychiatry data alters the distribution of psychiatric care across conditions to the extent that care for psychoses approximates that of the neuroses et al. category in the order of magnitude shown below:

Condition	Initial Delphi Panel Estimate on Distribution of Total Service Requirements	GMENAC Revisions on the Distribution of Total Service Requirements
Psychoses	41.0	48.2
Neuroses et al.	57.2	48.3
Mental Retardation	2.8	3.5

Dividing the service requirements by the accepted annual productivity of 6,624 units yields a need for 13,230 child psychiatrists, before correcting for care child psychiatrists provide to adults and the care general psychiatrists provide to children. Upon correcting for these factors, the need for child psychiatrists decreases to 10,320.

The Modeling Panel in reviewing the data on child psychiatry recommended that a range of 8,000 to 10,000 child psychiatrists be required for 1990. This range represents a dramatic increase in the number of child psychiatrists projected for 1990 (i.e., slightly over 4,000 are projected), yet has been advanced as an achievable goal which does not address all of the large unmet mental health needs of children. The Committee adopted the Modeling Panel's estimates as their recommendation.

Q. SIX SPECIALTIES FOR WHICH DELPHI PANELS WERE NOT CONVENED

It was the original intention of GMENAC to complete Delphi panel estimates of manpower needs in 23 specialty areas. However, neither time nor budget permitted the Committee to complete its task in time for the September 1980 report to the Secretary of Health and Human Services. In particular, it was not possible to conduct Delphi panels for the following six specialties:

1. Anesthesiology
2. Neurology
3. Nuclear Medicine
4. Pathology
5. Physical Medicine and Rehabilitation
6. Radiology.

The Committee has recommended that detailed Delphi panel exercises be carried out for each of these specialties in 1980-81. In the meantime, however, it was necessary to arrive at interim requirements estimates in order to complete the 1990 physician requirements picture.

In order to do this, the Office of Graduate Medical Education contracted with the Battelle Health and Population Study Center to prepare a background report on manpower needs in each of the six specialty aras. Given limited time and resources, the effort was limited to gathering and presenting the existing information on manpower requirements in each specialty. The information was gathered in two ways:

> A literature search was undertaken to survey all recent materials published in professional and academic journals, government reports, and other published sources on manpower requirements in each specialty.
>
> The appropriate specialty society was contacted in each specialty area and asked to assist by providing unpublished studies, other background data, or any materials which would be useful to this effort.

These materials were reviewed and analyzed for their implications for 1990 manpower requirements, and the results presented to the Modeling Panel.[1] The estimates of the Modeling Panel were based on their review of this report.

In the following six subsections, we summarize the manpower requirements issues and estimates in each specialty area. For a more complete discussion of each specialty, readers are referred to the report cited in footnote 1.

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[1] See Wills, 1980.

1. Anesthesiology

There is a fairly large literature dealing with manpower requirements in anesthesiology. Three sets of problems are central to the estimation of future manpower needs: First, there is the issue of regionalization of surgery. The extent to which surgical procedures will be centralized in regional medical centers, as opposed to distributed across many community hospitals, has a dramatic impact on manpower requirements. The reason for this is that the centralization of surgery permits the development of highly efficient anesthesia teams composed of anesthesiologists and nurse anesthetists. These team configurations can considerably enhance the productivity of the anesthesiologist, and by extension, reduce the overall number required.

The second issue is the extent to which anesthesia services should be supervised and directed by physician anesthesiologists, as opposed to other physicians or nurse anesthetists. Presently, a significant proportion of anesthesias are supervised by other than anesthesiologists, especially in delivery rooms but also in operating rooms. There appears to be considerable scope for improvement of quality of care by bringing more of this work under the guidance of the anesthesiologist.

Finally, the activities of the anesthesiologist outside of the operating room or delivery room are expanding. Pain management and critical care are among the areas in which an increased need for the services of anesthesiologists is foreseen.

Five different studies of anesthesiology manpower implied 1990 needs in the range of 16,000-24,000. (See the report cited earlier for details.) Based on these studies and on consideration of the issues outlined above, the Modeling Panel estimated 19,000-23,000 anesthesiologists to be needed in 1990. The Committee accepted the estimate of the Modeling Panel as its recommendation.

2. Neurology

In contrast to anesthesiology, the literature on manpower requirements in neurology is sparse and reaches widely varying conclusions. The principal difficulty in modeling manpower requirements in neurology arises from specification of the appropriate referral patterns. Nearly all neurological patients enter the neurologist's care through referral from other physicians. The extent to which other physicians refer diagnoses of apparent neurologic disorder is the critical factor which determines manpower needs in the specialty.

After further discussion of the problems, and a presentation to the Committee by a specialist, the Committee adopted 5,000-6,000 neurologists as its recommendation for the number required in 1990.

3. Nuclear Medicine

Manpower needs in nuclear medicine were perhaps more difficult to estimate than needs in any other specialty. There were several reasons for this. First, it is almost impossible to estimate the current level of manpower in the field. Most physicians who are practicing nuclear medicine do so on other than a full time basis, hence headcounts of practitioners grossly overstate manpower levels. Since so few practitioners are full-time in the field, AMA counts are unreliable. Furthermore, many practitioners are not board certified in nuclear medicine, although they may have certificates from the Boards of Radiology or Pathology. Finally, nuclear medicine is technologically dynamic, and manpower needs will be very sensitive to changes in technology in the upcoming decade. For all these reasons, it is especially important that the data necessary to estimate manpower needs in nuclear medicine be collected.

A summary of the literature in the field suggested the following (See the report cited in footnote 1 for references):

> Although there is some perception of a shortage of nuclear medicine personnel in academic departments, none of the reports suggested a shortage of clinical personnel.
>
> The number of physicians practicing nuclear medicine is probably somewhere in the range of 7,000. However, this is much higher than the number of full-time equivalents in the field, which is probably closer to 3,000.
>
> It has been suggested that any hospital of 400 beds could support one FTE in nuclear medicine, and many could support two. Accepting this leads to a need for 1,200 FTEs in larger hospitals, plus academic personnel and coverage in smaller hospitals. Assuming requirements for 1,000 FTE faculty, plus 1,000 FTEs for all small hospitals, leads to total requirements in the 3,000-3,500 FTE range. Use of nuclear medical personnel in even smaller hospitals, however, could raise this figure.
>
> The specialty has been and continues to grow rapidly; estimating manpower needs in the specialty is complicated by the current evolution of the field.

Based on these considerations, the Modeling Panel estimated 3,500-4,500 FTEs in nuclear medicine are required in 1990. The Committee adopted the Modeling Panel's estimate as its recommendation.

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4. Pathology

The last three decades have seen substantial growth in manpower in pathology as a result of both heavy research activity and the increased willingness of health insurers to pay for hospital and clinical testing. Although both of these trends have moderated in recent years, the specialty will probably continue to grow throughout the 1980s.

There is an extensive literature on manpower needs in pathology, which is surveyed in the report cited in footnote 1. Four reports projected 1990 manpower needs in pathology to be 13,000-15,000. Based on these considerations, the Modeling Panel estimated 1990 manpower requirements for 14,000-15,000 pathologists, and the Committee accepted this estimate as its recommmendation.

5. Physical Medicine and Rehabilitation

Although the available literature on manpower requirements in physical medicine is quite sparse, there appears to be a large and growing need for the services of physiatrists. The number of practitioners grew rapidly in the late 1960s and early 1970s, but since then has grown more slowly. The December 1978 number of practitioners was approximately 1,600, not counting residents.

As the population ages, there will presumably be an increased need for the services of physiatrists to treat chronic conditions. In addition, there is scope for physiatrists to take over care now being managed by physical therapists and chiropractors. (It should be noted, however, that nowhere is the concept of "team" care more fully developed than in physical medicine and rehabilitation.)

Based on these considerations, the Modeling Panel estimated a need for an increased number of physiatrists, to 2,400-4,000 in 1990. (The upper figure would bring the entire Nation up to the physiatrist-population ratio currently enjoyed by the best served 20 percent of the population.)

The Committee accepted the Modeling Panel's estimate as its recommendation.

6. Radiology

Early studies of manpower in radiology claimed a substantial shortage of practitioners in the field. Between the mid-1960s and mid-1970s, however, there was substantial growth in radiology and this went a long way toward easing the manpower shortages.

By and large, there appears to be a rough balance between supply and requirements in the specialty, although there also appear to be shortages in academic radiology and in therapeutic radiology. Several studies suggest 1990 manpower requirements in the range of 15,000-20,000 radiologists. Based on these studies, the Modeling Panel estimated 1990 requirements at 15,500 to 17,000 radiologists.

After considering the Modeling Panel's estimate and hearing a presentation by the specialty, the Committee recommended 1990 requirements of 17,000 to 19,000 radiologists. The increase was motivated principally by a concern for the heavy manpower requirements implied by new technologies.

IV. THE SUPPLY MODEL

In order to make recommendations for policy directions it is necessary to know both the ultimate goal at which to aim (i.e., the requirements for physicians by specialty) and how the system operates to produce a pool of practitioners of a given size and specialty distribution. The purpose of the supply model is to provide a mathematical description of the process by which the pool of practitioners is determined. Once the basic model of this process has been constructed it can be run under various assumptions or "scenarios" to see how physician supply and distribution respond to different policy interventions.

The supply model adopted by GMENAC was developed specifically for the Committee by a contractor to the Office of Graduate Medical Education. In this chapter we describe the model, starting with an abstract overview and proceeding to a detailed description of each component. Finally, the projected size and specialty distribution of physicians in 1990 is shown. [1]

OVERVIEW OF THE SUPPLY MODEL

A schematic overview of the supply model is shown in Figure IV.1. The general structure of the model is straightforward: Starting with an initial estimate of the size and specialty distribution of the pool of practitioners, the model projects future supply by adding new entrants into specialty practice from GME, and subtracts projected losses due to death, retirement, emigration, etc.

Because of a lack of data, it was not possible to model osteopathic supply in as great a detail as allopathic supply. Therefore, the projected output of osteopathic practitioners was estimated by a simplified model (described later) and added to the allopathic supply for 1990.

The supply model generates annual estimates of the total size and distribution of the pool of practitioners. The starting point of the model is the number and specialty and age distribution of physicians as reported on the AMA Physician Masterfile of December 31, 1978.

In the next section we describe each of the components of the supply model in more detail.

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[1] For further details see Hernandez and Hunt, 1980.

COMPONENTS OF THE SUPPLY MODEL

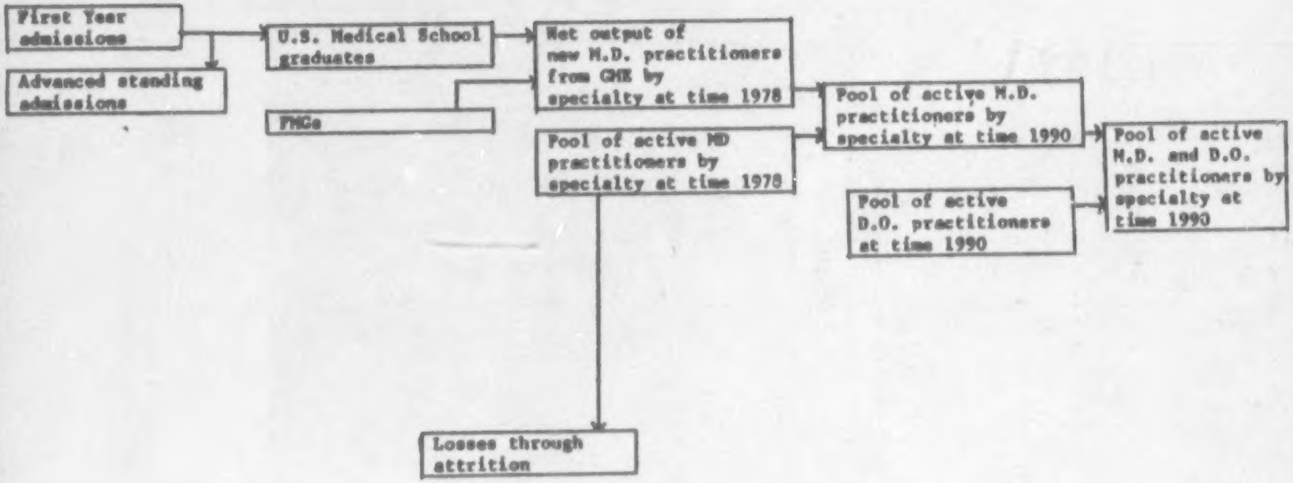
1. Net Output of New M.D. Practitioners from GME

The core of the supply model updating procedure is based on estimates of the size and specialty distribution of new practitioners entering the pool each year. This component of the supply model is derived from the "branching and switching" model of graduate medical education.

GMENAC's model of graduate medical education is a model of the process linking the distribution of residents in specialty programs with their eventual specialty distribution as practicing physicians. Given projections of the size of medical school graduating classes the estimates derived using the GME model permitted the projection of future specialty distribution from the current specialty distribution in the first postgraduate year.

Physicians often do not end up practicing in the specialty in which they began their graduate training. GMENAC recognized this and saw the need for better estimates of the actual process. An analysis of the graduate training histories of some 200,000 physicians was undertaken. The remainder of this subsection summarizes the results of this work.

Figure IV.1
THE SUPPLY MODEL


First Year admissions
Advanced standing admissions
U.S. Medical School graduates
FMGs
Net output of new M.D. practitioners from GME by specialty at time 1978
Pool of active MD practitioners by specialty at time 1978
Pool of active M.D. practitioners by specialty at time 1990
Pool of active D.O. practitioners at time 1990
Pool of active M.D. and D.O. practitioners by specialty at time 1990
Losses through attrition

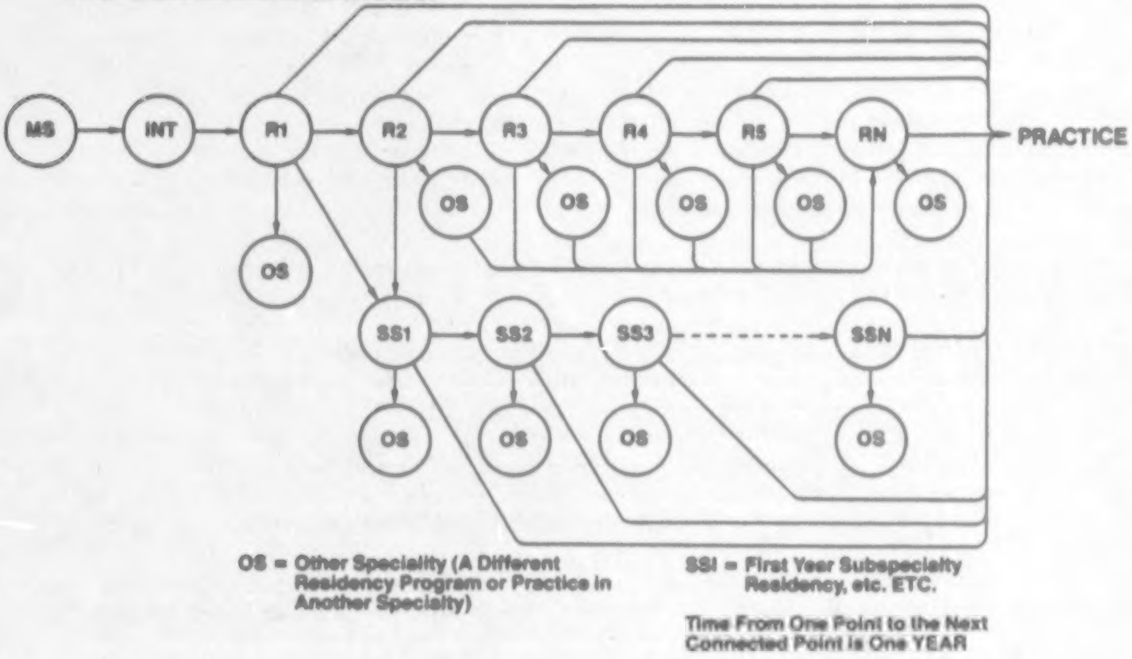
Structure of the Model--Graduate medical education (GME) has a structure similar to other types of higher education. Cohorts of students (physicians) enter at a starting point and progress to higher and higher levels with each passing year, finally completing some prescribed course of training. Historically much of GME has had the following form

MS → INT → R1 → R2 → R3 → Practice
(each step represents one year)

where MS = medical school
INT = internship
R1 = first year of residency, etc.

However, like other types of higher education, this simple progression does not describe the experience of every entrant. Not all go directly from one year to the next. Some drop out along the way (enter practice early), while others continue even longer than the stages shown. Still others branch off into subspecialties or even into entirely different residency programs. A more realistic picture of GME has the following form:

The General GME Model


MS
INT
R1
R2
R3
R4
R5
RN
PRACTICE
OS
SS1
SS2
SS3
SSN
OS = Other Speciality (A Different Residency Program or Practice in Another Specialty)
SSI = First Year Subspecialty Residency, etc. ETC.
Time From One Point to the Next Connected Point is One YEAR

Here OS = other specialty (a different residency program or practice in another specialty).
SS1 = first year subspecialty residency, etc.

Time from one point to the next connected point is 1 year.

The parameters of this model are the frequencies with which individual physicians follow the paths shown. However, in addition to estimating these frequencies, two other questions are important for their use in manpower planning. First, are the results stable or stationary over time? The importance of this question for long-term forecasting is obvious. Second, do two individuals who followed different paths but arrive at the same decision point have identical choice probabilities among future alternatives? If this property (called "history-independence") holds, the use and analysis of the estimates is greatly simplified. These two questions were addressed, and estimates of the model developed.

Estimates

Data and Methods--The major data base in the analysis was the American Medical Association's Physician Masterfile, supplemented with residency histories supplied by program directors. The analysis was estimated based on those active USMGs graduating between 1961-1975 who had interpretable GME data. These selection criteria provided 112,610 usable physician records.

Analyzing the data involved producing for each physician a year-by-year GME history. These histories were used to estimate the paths for each type of residency for each year's graduating class. These paths are characterized by a series of "transition frequencies." These frequencies represent the probability of dropping a particular alternative for the next year, given this year's location in the path. The "history-independence" property was tested by examining the stability of the transition probability between two points in the path or network for individuals arriving at the first point by different paths. Next, the transition probabilities were examined for different cohorts to see whether they were stable over time.

Results--As an example, Table IV.1 is the estimated transition matrix for general surgery. The numbers in the matrix are the probabilities of going from the positions listed down the left hand side to the positions listed along the top during a 1 year period. For example, if an individual is in a first-year general surgery residency, the probability of his going to a second-year general surgery residency is 0.73; that is, on the average 73 percent of first-year residents continue to second-year residencies in general surgery (See intersect of Row 3 and Column 4). Also, 8 percent go into orthopedic residencies (See intersect of Row 3 and Column 9), 6 percent into otolaryngology residencies, etc.

Analysis of the stability over time of the transition probabilities revealed that they were not stationary. Consequently, it was necessary to predict future values of the transition probabilities. This was accomplished using a constrained linear regression technique: the transition probabilities were assumed to be simple linear functions of time. The coefficients of this trend regression were estimated by fitting curves (using ordinary least squares) to past values and extrapolating into the future. The extrapolation technique makes use of two facts in generating estimates of future probabilities: Transition probabilities must sum to one at each point in time; and some transition probabilities are stationary. Hence, barring major structural change in GME, these estimates are probably quite reliable.

The other probability which is important to the model--"history independence" of the choices--was also tested, and was found to hold approximately for all testable transitions.

For further discussion of the issues concerning history independence and whether transition probabilities are stationary see (Hunt, 1980). The transition probabilities shown in Table IV.1 are the best predictions based on the analysis of trends in the probabilities.

The results also suggested that nominal GME output is only an approximate indicator of future specialty manpower supply. To predict specialty supply, it is essential to incorporate post-GME changes. These changes are included in Table IV.2, which summarizes residency input specialty output distributions for the programs studied. Note that the distributions are always the stable percentages of self-declared practice specialties reported subsequent to entering practice. Often these distributions have not become stabilized until 10 to 12 years after medical school--that is, as much as 8 years after GME is completed.

TABLE IV.1
TRANSITION MATRIX FOR GENERAL SURGERY (BEST PROJECTION ESTIMATES)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
MS	1		.99																			.01						
INT*	2			.99																		.01						
GS1	3				.73					.08				.06				.06					.03	.04				
GS2	4					.85				.02				.01				.01					.015	.015	.08			
GS3	5						.78			.005								.005					.06		.15			
GS4	6							.20															.16	.01	.63			
GS5	7								.32														.10		.58			
GS6	8								.35														.06		.59			
ORS1	9										.95															.05		
ORS2	10											.96														.05		
ORS3	11												.84													.16		
ORS4	12																									1.		
OTO1	13														1.													
OTO2	14															1.												
OTO3	15																.10										.90	
OTO4	16																										1.	
U1	17				.02														.97									.01
U2	18																			.95					.01			.04
U3	19				.02																.60							.38
U4	20				.07																.07							.86
UNK	21			1.																								
OSS**	22																						1.					
OS	23																							1.				
PRAC GS	24																								1.			
PRAC ORS	25																									1.		
PRAC OTO	26																										1.	
PRAC U	27																											1.

* Internship may actually be a specialized surgical internship or a first year surgical residency.
**Other surgical specialties are mainly plastic surgery, neurosurgery, thoracic surgery and colon and rectal surgery.

TABLE IV.2
RESIDENCY INPUT - SPECIALTY OUTPUT DISTRIBUTION
(INCORPORATES RESIDENCY CHANGES AND POST-GME SPECIALTY SWITCHES)

Residency Inputs	GS	ORS	OTO	U	PS	TS	NS	CRS	IM	CD	PUD	GE	PD	PDA	PDC	OBG	FP	P	CHP	R	DR	TR	OPH	PTH	AN	N	D	AM	PM	GPM	PH	OM	A	NM
GS	37.6	14.0	8.0	10.0	7.0	5.0	5.0	1.0	1.2	0.2		0.1	0.1			1.2	3.8	0.4	0.1	0.7	0.4	0.2	0.8	0.6	1.9	0.1		0.1	0.1	0.2	0.1	0.1		
ORS	2.9	91.3	0.2	0.1	0.1	0.1			0.8								1.5	0.2		0.7	0.2		0.4	0.1	0.6	0.4		0.2	0.2					
OTO	2.0	0.2	91.2		3.0	0.1			0.4								0.7			1.3			0.5	0.2						0.2		0.2		
U	1.0	0.6	0.3	90.4					1.5			0.5	0.4			1.0	1.0	0.5		1.0	0.5		0.5	0.4	0.4									
IM	0.4	0.5	0.3	0.5	0.1		0.1	0.1	60.7	12.3	3.7	5.2	0.4			0.3	2.5	1.4	0.1	1.8	1.2	0.1	1.3	0.5	0.3	2.1	1.7	0.1	0.2	0.1	0.6	0.2	1.2	
PD	0.1	0.3				0.1	0.1		5.7	0.1	0.1	0.7	76.3	1.9	1.6	0.1	1.2	1.7	1.4	0.6	0.6		0.5	0.6	0.6	2.7	0.6			0.5	1.2		0.7	
OBG	0.4	0.2		0.1					0.7				0.2			93.6	1.0	0.2	0.2	0.4		0.1	0.3	0.2	1.8	0.1				0.3	0.1		0.1	
FP	1.0	0.7	0.3						2.9	0.3			1.4			1.4	84.1	1.2		1.2	0.7		0.7	0.7	0.7		1.5	0.5			0.7			
P	0.2	0.1			0.1				1.1							0.2	1.9	81.5	12.2	0.2	0.1		0.1	0.8		1.1	0.1	0.1		0.1	0.1			
R		0.2	0.2			0.1			0.6	0.2			0.5			0.1	1.1	0.7		60.5	30.2	5.0	0.1	0.1	0.3							0.1		
DR										0.4			0.6							26.5	69.4	2.1			0.4	0.6								
OPH	0.2		0.1				0.1		0.2				0.2			0.1	0.3	0.4			0.1	0.1	97.5		0.2	0.1	0.1	0.1				0.2		
PTH	0.7	0.1	0.1	0.2					2.1	0.5	0.5	0.1	0.9			0.7	2.1	1.2		1.4	0.4	0.3	0.7	86.1	0.3	0.5	0.4	0.3			0.1			0.3
AN	0.5			0.2			0.4		0.6	0.2	0.2					0.4	2.0	0.7	0.2	0.2	0.2		0.4	0.2	92.5		0.2		0.4		0.5			
N	0.2	0.3					5.0		1.8				0.5				1.2	15.0	1.2	0.9	0.9		3.0	0.8	0.3	68.4	0.2	0.3						

2. Entrants Into GME

Entrants into Graduate Medical Education arrive from two sources: U.S. medical schools and foreign medical schools.

U.S. Medical School Graduates--The number of graduates of U.S. medical schools for each year is estimated from the admissions rate to medical school and from estimates of the number of transfers into advanced standing in U.S. medical schools, principally under the COTRANS system.

The model uses actual first year U.S. medical school enrollments for 1975, 1976, 1977 and 1978 to estimate the number of USMGs added to the GME pool starting in 1979. The enrollment for the 1978-1979 academic year (from the AAMC) was used to project future enrollments. The model currently assumes that 95 percent of each First Year Enrollments (FYE) cohort will complete medical school in 4 years and will take an allopathic residency. This assumption is based on an analysis of the trend in first year enrollment and graduates in the past 13 years. For our projections model it was assumed that U.S. allopathic school enrollment will grow at the rate of about 2.5 percent per year from 1978-79 through 1981-82, and become constant thereafter.

The output of U.S. medical schools depends not only on admission rates, but also on the number of transfers accepted for advanced standing. The principal (though not the only) source of these students has been the COTRANS program (recently supplanted by the Medical Sciences Knowledge Profile). In 1978-79, 858 students were accepted into advanced standing, 644 under COTRANS. These numbers are expected to decline, however, and the supply model simply projects a constant 500 entrants per year into GME from the COTRANS (or successor) program.

It is not sufficient, however, simply to know the size of the cohort of entrants to GME. It is also necessary to estimate how the entrants will distribute themselves across first year residencies, since this is the input which the GME component requires in order to generate output projections.

The distribution of medical school graduates into their first post graduate year (PGY-1) positions was estimated from the National Resident Matching Program (NRMP) data for 1977-1979. This distribution was then assumed to hold constant for future graduates.

Foreign Medical Graduates--FMGs in this model include both U.S. citizen and noncitizen FMGs. The basis for estimation of the future influx of FMGs into the M.D. GME pathway comes from an analysis of information provided by Dr. Ray Casterline, Executive Director of ECFMG.

Foreign medical graduates, both alien and U.S. citizens, are required to hold ECFMG certification to be eligible for training in accredited GME programs. One of the conditions for ECFMG certification is passing any one of the following examinations: Visa Qualifying Examination (VQE), Federation Licensing Examination (FLEX)[1], or ECFMG examination. Only 20 to 30 individuals per year take the FLEX examination, and for purposes of this projection, only individuals passing VQE and ECFMG examinations have significant impact.

The VQE was instituted under the provisions of P.L. 94-484. Successful VQE examinees are eligible for immigrant visas. However, U.S. citizen FMGs, graduates of Canadian medical schools, physicians of national or international renown and a substantial number of alien physicians, are exempt from the examination. Exempted alien physicians include:

-- close relatives (children, parents, spouses) of U.S. citizens or lawfully admitted aliens,

-- lawfully admitted refugees,

-- physicians who were in the U.S. prior to the effective date of PL 94-484, and held a visa other than a temporary visa,

-- board certified M.D.s who held a State license on or before January 9, 1977 and were in practice in a state on January 9, 1977.

Those FMGs, including U.S. citizens, exempted for the VQE must take the ECFMG examinations. Successful ECFMG examinees include individuals eligible for the exchange visitor program (temporary aliens), fifth pathway participants, as well as all other U.S. citizen FMGs. Thus the number of successful VQE and ECFMG examinees represents the pool of FMGs entering GME residencies. For purposes of supply estimation, a fixed number of FMGs are added annually to the GME pool. The projected number used is 4,100 under the scenario considered by GMENAC to be most likely in the absence of significant policy interventions.

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[1] Established in 1967 to provide a uniform test for use by State medical boards for individuals (U.S.-born or foreign-born) who are not eligible to take the examinations of the National Board of Medical Examiners (NBME).

3. Attrition from Current Pool of Practitioners

Projection of the number of physicians in active practice in 1990 also requires an estimate of the number of physicians retiring or dying within the projection period. For this estimation, separation rates developed by the Division of Manpower Analysis for its SOAR program were used. The separation rates included retirement from medicine (based on analysis of retirement data on AMA physicians for 1967-1974) and mortality rates (based on Goodman's Study of Mortality of Physicians)[1] for each sex and 5-year age group as shown in Table IV.3.

4. Supply of Osteopathic Practitioners

Insufficient information exists to enable the model to project the number of D.O.s. However, the American Osteopathic Association (AOA) Task Force on Graduate Medical education has estimated the number of D.O.s in 1988-1989. This estimate (29,094) is adjusted downward to account for residents and interns; in 1978, residents and interns represented 9 percent of active D.O.s. AOA's projection is based on an expected increase in student enrollment in the next 10 years, from 4,225 in 1978 to 7,152 in 1989. The number of specialists in 1990 is difficult to estimate in view of the lack of information on expansion of specialty residencies. For purposes of this report, the distribution of specialists reported in 1978 was maintained in the 1990 projection. The projections of supply of osteopathic physicians are shown in Table IV.4.

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[1] As reported in Hendrickson, 1975.

Table IV.3

ANNUAL SEPARATION RATES FOR PHYSICIANS*

	Percent	
Age	Male	Female
30	.096	.430
30-34	.120	1.330
35-39	.148	-.102
40-44	.238	1.310
45-49	.477	-.251
50-54	.801	1.207
55-59	1.416	2.013
60-64	6.597	4.497
65-69	3.115	3.249
70-74	11.385	11.537
75 +	19.165	18.195

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*Source: Hernandez and Hunt, 1980.

Table IV.4

GMENAC PROJECTION OF OSTEOPATHIC PHYSICIANS, 1990
EXCLUDES INTERNS AND RESIDENTS*

Specialty	1990 Projection Number
Anesthesiology	323
Dermatology	54
Internal Medicine	505
Neurology and Psychiatry	158
Nuclear Medicine	107
Obstetrics/Gynecology	170
Ophthalmology and Otorhinolaryngology	221
Pathology	156
Pediatrics	158
Proctology	93
Radiology	544
Rehabilitation Medicine	87
General Surgery	460
Neurological Surgery	15
Orthopedic Surgery	164
Thoracic Surgery	24
Urological Surgery	54
Other Certified Specialists	144
General Practice	23,033
TOTAL	26,470

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*Aggregate number derived from the Kellogg Study on Graduate Medical Education, American Osteopathic Association.

V. COMPARISON OF SUPPLY AND REQUIREMENTS AND RECOMMENDATIONS FOR RESIDENCY TRAINING SLOTS

A. Comparison of Supply and Requirements

1. Specialty Specific Comparison

Table V.1 compares, for each specialty, the 1990 projected supply of physicians with the requirements generated by the adjusted needs-based model. The projected supply corresponds to the set of assumptions considered by GMENAC to be the "most probable" scenario in the absence of significant policy interventions [1]; that is, in addition to the set of assumptions utilized by the American Osteopathic Association in its estimation of D.O. projections as described previously it is assumed that

- U.S allopathic medical school enrollments will grow at a rate of about 2½ percent per year 1978-79 through 1981-82, and become constant thereafter;
- FMGs entering residency programs will increase to 4,100 per year by 1983, and remain constant thereafter; and
- GME entrants will continue to be distributed across residency programs as they were in 1979.

The total projected supply in Table V.1 is the sum of practicing physicians plus the contribution of residents in training in 1990. However, the service contribution of a resident is assumed to equal, on the average, 35 percent of the contribution of a full-time practicing physician. Therefore, total supply is equal to the number of practicing physicians plus 35 percent of the number of residents in each specialty.

As can be seen from Table V.1, most specialties will exhibit a surplus of physicians in 1990 under this scenario. The net total surplus across all specialties is projected to be 69,750 physicians. This net surplus figure is misleading, however, since it, in effect, "cancels out" some of the projected surpluses with shortages in other specialties. In fact, such substitutions are, of course, not necessarily possible--a surplus of general surgeons is of no value in mitigating a shortage of psychiatrists. Furthermore, very few changes in the composition of the specialty pool can be made because nearly all of the 1990 supply is either already in practice or in a residency program.

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[1] Other assumptions, of course, can be made concerning the rate of growth of medical school enrollment and rate of FMG entry, depending upon the type of policy interventions considered likely. Volume I of this report contains a projection of aggregate physician supply under four different scenarios.

Pediatrics and Subspecialties--Table V.1 shows that there will be a surplus of about 4,950 pediatricians in 1990. (The AMA Masterfile used for the supply baseline does not separately identify the pediatric subspecialties, except for allergy and cardiology. Hence, the 1978 supply and 1990 projected supply are probably undercounts, with some subspecialists subsumed in general pediatrics. Hence projected surpluses or shortages should be viewed with caution.)

General Psychiatry and Child Psychiatry--Both these specialties will be undermanned in 1990; general psychiatry by 8,000 and child psychiatry by 4,900. Simply increasing the input into psychiatry residencies will not satisfy both shortages simultaneously. While suppply projections indicate a ratio of adult to child psychiatrists of over 7 to 1, the shortages are in a ratio of about 3 to 2. Therefore, the input must be raised and the output ratio between adult and child psychiatrists must be altered. However, it cannot be over emphasized that the gainful deployment of these physicians depends upon the availability of funds for their services. Such funds are currently not available.

Obstetrics/Gynecology--There will be about 10,450 surplus specialists in this practice area by 1990 under current input assumptions.

Internal Medicine and Subspecialties--The supply situation here is a projected surplus of general internists of 3,550 combined with a surplus of subspecialists of more than 17,000, 40 percent of which is in cardiology. Therefore, both total input but in particular the subspecialization rate must be decreased.

Family Practice--By 1990 there may be about 61,750 MD family practitioners and 23,050 DO generalists, excluding residents. As a result of the approach used by the Modeling Panel to apportion requirements among general internal medicine, allopathic general/family practice, and osteopathic general practice, adding the contribution of residents to patient care produces a supply that is about five percent greater than projected requirements.

Surgical Specialties--This group represents the area of most significant oversupply. By 1990 there are expected to be about 28,150 excess surgical specialists of all types. Surgery is also the most intractable area as far as GME adjustments are concerned, for two reasons. Residencies are long (median length 5 to 6 years) so that a long lead time is necessary to achieve any impact on supply. Second, surgical residency programs are interrelated in complicated ways (Part IV). Most surgeons start in general surgery residencies, but there are also some smaller autonomous programs such as orthopedics, otolaryngology and urology. Therefore, cutting back general surgery input reduces all surgical output, but in different proportions, depending on the particular subspecialty.

Preventive Medicine, Public Health, Occupational Medicine, Aerospace Medicine--These areas show large shortages in Table V.1 but here there is a mitigating factor to consider. The GME model does not adequately describe how other specialists switch into these areas, because many of the changes occur in midcareer, long after initial residency training has been completed. Such changes are probably substantially underrepresented in the empirical data on branching in the GME model which is used to predict specialty outputs. Some of this apparent shortage may also be hidden in the "other specialty" category, and some in the excesses of the other specialties which are sources of this group.

Anesthesiology--Under current supply projections there will be a shortage of approximately 1,550 anesthesiologists in 1990.

Physical Medicine--The model implies a substantial manpower shortage in physical medicine in 1990.

Radiology, Diagnostic and Therapeutic Radiology--Like surgery, radiology supply far exceeds estimated requirements.

Emergency Medicine--The projected supply of emergency medicine physicians was derived by adding the number of graduating residents to the unpublished AMA base of emergency medicine physicians and by assuming that the number of graduates will gradually increase to 400 by 1983 and will remain constant after that date. While the table indicates a projected shortage, there are probably many other specialists who provide emergency care, as well as retired physicians and "moonlighting" residents who staff emergency departments on a part-time basis.

Nuclear Medicine--Data from the AMA describing the pool of practicing physicians in 1978 (the base year for projections) do not identify nuclear medicine as a practice area but include these physicians in other specialties. Consequently, the supply projections for this specialty are highly uncertain. Still, the expected supply of nuclear medicine specialists seems close to requirements, if the proportion of radiologists practicing in the field remains roughly constant. Further study of nuclear medicine manpower needs to be undertaken, however.

TABLE V.1.

SPECIALTY SPECIFIC PHYSICIAN SUPPLY & REQUIREMENTS: SURPLUS & SHORTAGE ESTIMATES FOR 1990

	Physicians[a]	Total Residents/ Fellows	Total[b][c] Supply	Requirements	Surplus (Shortage)
All Physicians	504,750	88,500	535,750	466,000	69,750
Osteopathic General Practice	23,050	2,300	23,850	22,700	1,150
General/Family Practice	61,750	7,600	64,400	61,300	3,100
General Pediatrics	35,300	7,050	37,750	30,250	7,500
Pediatric Allergy	750	450	900	900	-
Pediatric Cardiology	850	400	1,000	1,150	(150)
Pediatric Endocrinology	250	N/A	250	800	(550) [d]
Pediatric Hematology/Oncology	500	200	550	1,650	(1,100) [d]
Pediatric Nephrology	200	N/A	200	350	(150) [d]
Neonatology	700	N/A	700	1,300	(600) [d]
General Internal Medicine	66,500	20,800	73,800	70,250	3,550
Allergy and Immunology	3,000	150	3,050	2,050	1,000
Cardiology	14,250	1,900	14,900	7,750	7,150
Endocrinology	3,700	500	3,850	2,050	1,800
Gastroenterology	6,550	1,000	6,900	6,500	400
Hematology/Oncology	7,850	1,300	8,300	9,000	(700)
Infectious Diseases	3,050	500	3,250	2,250	1,000
Nephrology	4,600	700	4,850	2,750	2,100
Pulmonary Diseases	6,600	1,050	6,950	3,600	3,350
Rheumatology	2,850	500	3,000	1,700	1,300
*Neurology	8,300	950	8,650	5,500*	3,150*
Dermatology	7,150	700	7,350	6,950	400
Psychiatry (General)	29,250	3,550	30,500	38,500	(8,000)
Child Psychiatry	4,050	200	4,100	9,000	(4,900)
Obstetrics/Gynecology	32,300	6,200	34,450	24,000	10,450
General Surgery	32,100	9,200	35,300	23,500	11,800
Neurosurgery	4,850	700	5,100	2,650	2,450
Ophthalmology	15,400	2,600	16,300	11,600	4,700
Orthopedic Surgery	19,000	3,150	20,100	15,100	5,000
Otolaryngology	8,000	1,400	8,500	8,000	500
Plastic Surgery	3,700	600	3,900	2,700	1,200
Thoracic Surgery	2,700	450	2,900	2,050	850
Urology	8,800	1,600	9,350	7,700	1,650
Emergency Medicine	8,900	1,000	9,250	13,500	(4,250)
Preventive Medicine	5,550	N/A	5,550	7,300	(1,750)
*Anesthesiology	18,750	2,050	19,450	21,000*	(1,550)*
*Nuclear Medicine	N/A	N/A	N/A [e]	4,000*	N/A[f]*
*Pathology	16,000	2,450	16,850	13,500*	3,350 *
*Physical Medicine & Rehabilitation	2,350	150	2,400	3,200*	(800)*
*Radiology	26,450	3,800	27,800 [e]	18,000*	9,800 *
All other and unspecified	9,200	1,450	9,700	-	N/A

N/A — Not available

* The requirements in these six specialties were estimated crudely after a brief review of the literature. (Wills, 1980) They should be considered approximations, and tentative. The full GMENAC modeling methodology will be applied to them in 1980-81.

Footnotes to TABLE V.1

a/ Excludes residents and fellows.

b/ Includes all professionally active physicians (M.D.s and D.O.s) together with 0.35 of all residents in training in the year indicated. The 1990 and 2000 figures assume that U.S. allopathic medical school first year enrollment will increase 2.5 percent per year until 1982-83 for a total increase of 10 percent over the 1978-79 enrollment of 16,501, and then will remain level at 18,151, that U.S. osteopathic medical school enrollment will increase 4.6 percent per year until 1987-88 for a total increase of 41 percent over the 1978-79 number of 1,322, and then will remain level at 1,868, and that FMGs will be added to the residency pool at the rate of 3,100/year in 1979-80, increase to 4,100/year by 1983, and then remain level. All data in the following tables have been calculated using these assumptions.

c/ Residents and fellows in training have been added to the supply figures at a rate of 0.35 times their number. GMENAC has estimated that residents and fellows provide direct health services at approximately 35 percent the level of a full-time practicing physician.

d/ The 1978 AMA masterfile does not contain data for the pediatric subspecialties other than for pediatric allergy and cardiology. Therefore, the 1990 supply for the pediatric subspecialties in TABLES V.1 and V.4 are likely to be significantly under-enumerated, and calculations of shortage may contain large errors.

e/ There may be approximately 3,000 nuclear medicine specialists at the present time. Accurate enumeration is impossible because many list their principal specialty as radiology. The supply and the estimated surplus of radiologists, therefore, may be inflated.

f/ The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine have been ommitted, and calculations of surplus, balance, or shortage cannot be made.

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Notes to Tables V.1 through V.7

1. The supply projections include MDs and DOs and are calculated from the following data sources: 1978 American Medical Association masterfile; 1979 American Osteopathic Association Survey; and The Directory of Residency Training Programs, 1979-80 Edition, Liaison Committee on Graduate Medical Education/American Medical Association.

   The osteopathic physicians in general practice are reported separately from the allopathic family/general physicians. The small number of osteopathic physicians (TABLE IV.4) in the other specialties are included with the allopathic numbers.

   Family Practice in these Tables refers to both allopathic family physicians and allopathic general practitioners. Since the number of the latter in 1990 will be very small the designation Family Practice is used for the combined group.

   The sum of the specialty specific supply estimates exceeds the total due to rounding of data, and the fact that Psychiatry and Neurology, as well as Ophthalmology and Otolaryngology, are combined specialties for osteopathic medicine. In the tables the numbers for each of these four specialties includes osteopathic physicians, thus creating a double count. Their number is included in the total only once.

   The supply numbers include professionally active physicians (MDs and DOs) together with 35 percent of all residents and fellows in training in that year.

2. The 1978 AMA masterfile does not contain data for the pediatric subspecialties other than for pediatric allergy and cardiology. Therefore, the 1990 supply for the pediatric subspecialties in TABLES V.1 and V.4 are likely to be significantly under-enumerated, and calculations of shortage may contain large errors.

3. General Internal Medicine includes Diabetes, Geriatrics and Nutrition.

4. The 1978 Fellowship numbers for the Internal Medicine subspecialties taken from results of a manpower survey by the Federated Council of Internal Medicine.

5. Hematology/Oncology includes Neoplastic Diseases.

6. General Surgery includes Colon and Rectal Surgery, Pediatric Surgery and portions of Vascular Surgery.

7. The following assumptions were used to project the 1990 Emergency Medicine supply: 225 residents completed their training in 1980; this number will increase to 400 by 1983 and then will remain at that level.

8. Preventive Medicine includes Public Health, Occupational Medicine and Aerospace Medicine.

Notes to Tables V.1 through V.7 (Continued)

9. The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine have been ommitted, and calculations of surplus, balance, or shortage cannot be made.

10. Neurology includes Pediatric Neurology.

11. Both supply projections and requirements estimates include physicians engaged primarily in research, teaching, and administration as well as patient care.

2. Aggregate Supply and Requirements Comparison

Table V.2 compares aggregate physician supply and requirements for 1978, 1990, and 2000. The 1990 and 2000 supply projections are again based on the assumptions discussed earlier. The requirements estimates for 1990 are those adopted by GMENAC; the 1978 and 2000 requirements figures were derived by preserving the implied 1990 physician-to-population ratio.

TABLE V.2

AGGREGATE PHYSICIAN SUPPLY AND REQUIREMENTS:
1978, AND ESTIMATES FOR 1990 AND 2000

	1978	1990	2000
Physician Supply a/	374,800	535,750	642,950
Physician Requirements b/	418,550	466,000	498,250
Surplus (Shortage)	(43,750)	69,750	144,700

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a/ Includes all professionally active physicians (M.D.s and D.O.s) together with 0.35 of all residents in training in the year indicated. The 1990 and 2000 figures assume that U.S. allopathic medical school first year enrollment will increase 2.5 percent per year until 1982-83 for a total increase of 10 percent over the 1978-79 enrollment of 16,501, and then will remain level at 18,151, that U.S. osteopathic medical school enrollment will increase 4.6 percent per year until 1987-88 for a total increase of 41 percent over the 1978-79 number of 1,322, and then will remain level at 1,868, and that FMGs will be added to the residency pool at the rate of 3,100/year in 1979-80, increase to 4,100/year by 1983, and then remain level. All data in the following tables have been calculated using these assumptions.

b/ The 1978 and 2000 figures on requirements are extrapolated from the 1990 calculated requirements simply on the basis of the population differences in the three years.

As Table V.2 shows, the overall surplus of physicians is projected to grow even worse in the decade 1990-2000. The increases of medical school enrollments of recent years not only mean that larger numbers of practitioners are produced each year, but also that by 1990 a sizable proportion of the pool of practitioners will be quite young, which means that attrition through death and retirement will slow down in the 1990s. The size of the projected surplus in 2000 highlights the need for rapid and decisive action if a gross oversupply is to be averted.

Table V.3 provides further data on the dimensions of the probable oversupply. As can be seen there, the rate of increase in supply of physicians far outstrips the expected population growth, leading to a dramatic rise in the physician-to-population ratio.

TABLE V.3

AGGREGATE PHYSICIAN SUPPLY, TOTAL U.S. POPULATION, AND PHYSICIAN TO POPULATION RATIO 1978, AND ESTIMATES FOR 1990 AND 2000

	1978	1990	PERCENT CHANGE (1978-1990)	2000	PERCENT CHANGE (1978-2000)
Population (thousands)	218,717 a/	243,513 b/	11%	260,378 b/	19%
Physician Supply c/	374,800	535,750	43%	642,950	72%
Physician/ 100,000 population	171	220	28%	247	44%

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a/ U.S. Census, Series P-25, Number 888, Current Population Reports, "Estimates of U.S. Population to May 1, 1980," issued July 1980.

b/ U.S. Census, Series P-25, Number 704, Current Population Reports, "Projection of Population of United States, 1977-2050," issued July 1977.

c/ Includes all professionally active physicians (M.D.s and D.O.s) together with 0.35 of all residents in training in the year indicated. The 1990 and 2000 figures assume that U.S. allopathic medical school first year enrollment will increase 2.5 percent per year until 1982-83 for a total increase of 10 percent over the 1978-79 enrollment of 16,501, and then will remain level at 18,151, that U.S. osteopathic medical school enrollment will increase 4.6 percent per year until 1987-88 for a total increast of 41 percent over the 1978-79 number of 1,322, and then will remain level at 1,868, and that FMGs will be added to the residency pool at the rate of 3,100/year in 1979-80, increase to 4,100/year by 1983, and then remain level. All data in the following tables have been calculated using these assumptions.

3. Trends in Specialty Specific Supply

Table V.4 shows the projected 1978-1990 supply increase on a specialty-specific basis, and Table V.5 shows the corresponding changes in physician-to-population ratios. Here, as elsewhere, total physician supply is equal to the sum of practicing physicians plus 35 percent of the number of residents. Hence, these figures are "conservative" compared to headcounts which weight practitioners and residents equally in computing total supply.

RESIDENCY TRAINING SLOTS

1. Residency Training

Given a desired range of requirements for physicians in 1990, the question arises, "What configuration of residency training slots will lead us from the current supply to that goal?" In order to answer this question, the physician supply model discussed in Part IV was "run backwards" using the 1990 requirements as inputs. That is, the standard physician supply model takes current supply and projected new entrants to GME and forecasts the future size and distribution of the supply of practitioners. To "run the model backwards," however, we take the desired size and distribution of the pool and use the model to determine the configuration of residency training needed to achieve the 1990 goal.

If specialty "x" is estimated by GMENAC to be in balance in 1990, their balance should be realized if the residency training programs in that specialty actually produce graduates in the numbers assumed by the GME Model as well as if the estimated immigration rates of FMG's into that specialty actually occur.

Unfortunately, there is no guarantee that a solution exists to the problem of imbalance between requirements and supply. In fact, within the current framework of GME, it appears that the 1990 goals for numbers and distribution of physicians cannot be fully realized.

There are two reasons why it is not possible to achieve the estimated requirements goals by 1990. First, the constraints imposed by the current size of the practitioner pool and by the numbers of current residents mean that in some specialties exhibiting a projected surplus, the surplus could not be eliminated by 1990 even if the number of new entrants to specialty training were immediately cut to zero, a patently unacceptable policy. This is the case, for example, with the surgical specialties.

But a second and more fundamental reason why the supply model cannot yield a unique estimate for the number of training slots is that the historical pattern of branching and switching upon which the supply model is based is simply inconsistent with the desired distribution of

TABLE V.4

SUPPLY OF PHYSICIANS BY SPECIALTY
1978, AND ESTIMATES FOR 1990

	1978	1990 a/	Percent Change
All Physicians	374,800	535,750	+43
Osteopathic General Practice	13,550	23,850	+76
General/Family Practice	54,350	64,400	+18
General Pediatrics	23,800	37,750	+59
Pediatric Allergy	450	900	+100
Pediatric Cardiology	600	1,000	+67
Pediatric Endocrinology	N/A	250	N/A b/
Pediatric Hematology/Oncology	N/A	550	N/A b/
Pediatric Nephrology	N/A	200	N/A b/
Neonatology	N/A	700	N/A b/
General Internal Medicine	48,950	73,800	+51
Allergy and Immunology	2,100	3,050	+45
Cardiology	7,700	14,900	+94
Endocrinology	1,400	3,850	+175
Gastroenterology	2,900	6,900	+138
Hematology/Oncology	3,000	8,300	+177
Infectious Diseases	850	3,250	+282
Nephrology	1,450	4,850	+235
Pulmonary Diseases	2,800	6,950	+148
Rheumatology	1,000	3,000	+200
Neurology	4,850	8,650	+78
Dermatology	5,000	7,350	+47
Psychiatry (General)	25,250	30,500	+21
Child Psychiatry	3,050	4,100	+34
Obstetrics/Gynecology	23,100	34,450	+49
General Surgery	30,700	35,300	+15
Neurosurgery	3,000	5,100	+70
Ophthalmology	11,750	16,300	+39
Orthopedic Surgery	12,350	20,100	+63
Otolaryngology	6,100	8,500	+39
Plastic Surgery	2,600	3,900	+50
Thoracic Surgery	2,100	2,900	+38
Urology	7,100	9,350	+32
Emergency Medicine	5,000	9,250	+85
Preventive Medicine	6,100	5,550	- 9
Anesthesiology	14,850	19,450	+31
Nuclear Medicine	N/A	N/A	N/A c/
Pathology	12,650	16,850	+33
Physical Medicine & Rehabilitation	2,000	2,400	+20
Radiology	18,550	27,800	+50
All other and unspecified	14,000	9,700	-31

N/A - not available

a/ Includes all professionally active physicians (M.D.s and D.O.s) together with 0.35 of all residents in training in the year indicated. The 1990 and 2000 figures assume that U.S. allopathic medical school first year enrollment will increase 2.5 percent per year until 1982-83 for a total increase of 10 percent over the 1978-79 enrollment of 16,501, and then will remain level at 18,151, that U.S. osteopathic medical school enrollment will increase 4.6 percent per year until 1987-88 for a total increase of 41 percent over the 1978-79 number of 1,322, and then will remain level at 1,868, and that FMGs will be added to the residency pool at the rate of 3,100/year in 1979-80, increase to 4,100/year by 1983, and then remain level. All data in the following tables have been calculated using these assumptions.

b/ The 1978 AMA masterfile does not contain data for the pediatric subspecialties other than for pediatric allergy and cardiology. Therefore, the 1990 supply for the pediatric subspecialties in TABLES V.1 and V.4 are likely to be significantly under-enumerated, and calculations of shortage may contain large errors.

c/ The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine have been ommitted, and calculations of surplus, balance, or shortage cannot be made.

TABLE V.5

U.S. POPULATION PER ONE PHYSICIAN, SPECIALTY SPECIFIC 1978, and ESTIMATES FOR 1990

	1978 (pop. 218,717,000)		1990 a/ (pop. 243,513,000)d/	
All Physicians	1 per	580	1 per	455
Osteopathic General Practice	1 per	16,100	1 per	10,200
General/Family Practice	1 per	4,000	1 per	3,800
General Pediatrics	1 per	9,200	1 per	6,500
Pediatric Allergy	1 per	468,300	1 per	270,600
Pediatric Cardiology	1 per	344,400	1 per	243,500
Pediatric Endocrinology		N/A		N/A b/
Pediatric Hematology/Oncology		N/A		N/A b/
Pediatric Nephrology		N/A		N/A b/
Neonatology		N/A		N/A b/
General Internal Medicine	1 per	4,500	1 per	3,300
Allergy and Immunology	1 per	103,300	1 per	79,800
Cardiology	1 per	28,400	1 per	16,300
Endocrinology	1 per	158,100	1 per	63,300
Gastroenterology	1 per	75,300	1 per	35,300
Hematology/Oncology	1 per	72,600	1 per	29,300
Infectious Diseases	1 per	250,500	1 per	74,900
Nephrology	1 per	148,900	1 per	50,200
Pulmonary Diseases	1 per	78,700	1 per	35,000
Rheumatology	1 per	218,300	1 per	81,200
Neurology	1 per	45,000	1 per	28,200
Dermatology	1 per	43,600	1 per	33,100
Psychiatry (General)	1 per	8,700	1 per	8,000
Child Psychiatry	1 per	71,900	1 per	59,400
Obstetrics/Gynecology	1 per	9,500	1 per	7,100
General Surgery	1 per	7,100	1 per	6,900
Neurosurgery	1 per	73,300	1 per	47,700
Ophthalmology	1 per	18,600	1 per	14,900
Orthopedic Surgery	1 per	17,700	1 per	12,100
Otolaryngology	1 per	36,000	1 per	28,600
Plastic Surgery	1 per	84,300	1 per	62,400
Thoracic Surgery	1 per	103,500	1 per	84,000
Urology	1 per	30,800	1 per	26,000
Emergency Medicine	1 per	43,800	1 per	26,300
Preventive Medicine	1 per	35,800	1 per	43,900
Anesthesiology	1 per	14,700	1 per	12,500
Nuclear Medicine		N/A		N/A c/
Pathology	1 per	17,300	1 per	14,500
Physical Medicine & Rehabilitation	1 per	109,200	1 per	101,500
Radiology	1 per	11,800	1 per	8,800
All other and unspecified	1 per	15,600	1 per	25,100

a/ Includes all professionally active physicians (M.D.s and D.O.s) together with 0.35 of all residents in training in the year indicated. The 1990 and 2000 figures assume that U.S. allopathic medical school first year enrollment will increase 2.5 percent per year until 1982-83 for a total increase of 10 percent over the 1978-79 enrollment of 16,501, and then will remain level at 18,151, that U.S. osteopathic medical school enrollment will increase 4.6 percent per year until 1987-88 for a total increase of 41 percent over the 1978-79 number of 1,322, and then will remain level at 1,868, and that FMGs will be added to the residency pool at the rate of 3,100/year in 1979-80, increase to 4,100/year by 1983, and then remain level. All data in the following tables have been calculated using these assumptions.

b/ The 1978 AMA masterfile does not contain data for the pediatric subspecialties other than for pediatric allergy and cardiology. Therefore, the 1990 supply for the pediatric subspecialties in TABLES V.1 and V.4 are likely to be significantly under-enumerated, and calculations of shortage may contain large errors.

c/ The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine have been ommitted, and calculations of surplus, balance, or shortage cannot be made.

d/ The total U.S. population number was utilized for each calculation in this table. The numbers are not adjusted by age for pediatric specialties or by age and sex for obstetrics/gynecology.

NOTE: Unrounded supply estimates were used in the calculations for this table.

specialists. To achieve the desired goals will require not merely a reduction in the number of entrants to GME, but also a change in the pattern of specialty choice within GME. So long as the current pattern of GME persists, the problem is "overdetermined" and no solution exists which can be reached simply by altering the numbers of new entrants.[1]

Nonetheless, the supply model can provide valuable guidance in a heuristic sense even though it does not yield a simple numerical solution. The model clearly suggests, for example, that it will be necessary to reduce the subspecialization rate among internal medicine residents, and to increase the ratio of child to adult psychiatrists if the goals are to be approached. In addition, it is clear that increases and decreases in different specialty's residency training must be accomplished, even though it is impossible to state the precise magnitude of these changes.

Based on an analysis of the disparities between supply and requirements by specialty, and of the constraints imposed by current supply, the Modeling Panel developed a set of specific changes in the numbers of entrants to specialty training for 1986. These estimates are displayed in Table V.6.

Total entrants to first year specialty training in Table V.6 are composed of two groups: (1) those who enter specialty training in their first postgraduate year (PGY1), and (2) those who enter specialty training at some later time, after completing one or more postgraduate years in other specialties or in general training. Thus, Table V.6, containing data on illustrative rates of entry into first year graduate medical education is particularly relevant to medical students: this information tells them what distribution of residency offerings they should expect to face upon graduation from medical school. On the other hand, Table V.7 containing data on first year specialty training which is the sum of both groups described above, is particularly relevant to residency program directors: this table gives GMENAC's illustrative estimates for the overall size of first year specialty training positions to be offered.

In some cases, the Modeling Panel's target for the size of the residency program to be offered took into account recognition of special problems facing the specialty. Thus:

- No change in the number of pediatric subspecialty positions was indicated, largely because of a lack of good data on the current number and distribution of subspecialty trainees. Pediatrics should be encouraged to build a reliable data base of these numbers, akin to that currently being compiled for the internal medicine subspecialties.

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[1] For further details on the mathematical problems involved see (Hunt, n.d.)

- Although the Committee considered a 20 percent increase in entrants to emergency medicine (since this is probably the best that can be accomplished by 1986), it would be desirable for emergency medicine training to expand even further, to the point where 400 physicians per year would enter the specialty.

It is also important to note that the total number of filled first year residencies will presumably peak in the mid-1980s, before it can begin to decline. This is a necessary, if unfortunate, consequence of the recent history of medical school admissions. Program directors should not plan on sustaining permanently the increase in the size of residency programs required in the early part of the decade. Last, but importantly, a comparison of available PGY-1 positions with the graduating class is incomplete if consideration is only given to the USG's and FMG's who intend to provide services in this country. Accommodations must also be made for trainees who will return to their country of origin upon terminating GME in this country. Such adjustments have not been considered by GMENAC.

TABLE V.6

ILLUSTRATIVE RATES OF ENTRY INTO FIRST-YEAR GRADUATE MEDICAL EDUCATION PGY-1 FOR 1986-87

	PROJECTED 1990 SURPLUS (SHORTAGE)	1979-80 GME ENTRY RATES AT PGY-1 LEVEL	1986-87 ILLUSTRATIVE TREND % CHANGE	1986-87 GME ENTRY RATES AT PGY-1
TOTAL		20,474	-2	20,030
Osteopathic Interns	1,150	1,050	-2	1,030a/
Flex Interns	N.A	1,325	+15	1,500b/
Family Practice	3,100	2,347	c/	2,347
General Pediatrics and Subspecialties	4,950	2,030	c/	2,030
General Internal Medicine	3,550	6,730	c/	6,730
Obstetrics/Gynecology	10,450	1,100	-20	880
*Neurology	3,150 *	113	0	113
Dermatology	400	13	0	13
Psychiatry	(8,000)	714	+20	856
General Surgery	11,800	2,817	-20	2,254
Neurosurgery	2,450	31	-20	25
Ophthalmology	4,700	65	-20	52
Orthopedic Surgery	5,000	240	-20	192
Otolaryngology	500	40	0	40
Urology	1,650	60	-2	48
Emergency Medicine	(4,250)	225	N.A. d/	400
*Anesthesiology	(1,550)*	400	-10	510
*Pathology	3,350 *	559	-5	531
*Physical Med. & Rehab.	(800)*	85	+20	102
*Radiology	9,800 *	470	-20	376

N.A. — Not applicable

a/ Derived using the same proportional decrease (minus 2 percent) in the total number of positions for allopathic medicine between 1979-80 and 1986-87.

b/ These positions provide the first year clinical training for several specialties and are likely to be called the transitional year in the future. Therefore, GMENAC suggests a 15 percent increase in the number of these positions.

c/ While the 1990 projected supply is slightly greater than requirements for all three of these specialties, GMENAC suggests that the current number of residency positions be retained in the 1980s in order to accommodate the anticipated surplus in the aggregate number of residents and physicians.

d/ The following assumptions were used to project the 1990 Emergency Medicine supply: 225 residents completed their training in 1980; this number will increase to 400 by 1983 and then will remain at that level.

* The requirements in these five specialties were estimated crudely after a brief review of the literature. They should be considered approximations, and tentative. The full GMENAC modeling methodology will be applied to them in 1980-81.

TABLE V.7

ILLUSTRATIVE RATES OF ENTRY INTO SPECIALTY TRAINING (R-1) FOR 1986-87

	1990 ESTIMATED SURPLUS (SHORTAGE)	1979-80 SPECIALTY ENTRY RATES AT R-1 [a]	1986-87 ILLUSTRATIVE TREND % CHANGE	1986-87 SPECIALTY ENTRY RATES AT R-1 [a]
TOTAL		26,851	-5	25,554
Osteopathic Residents	1,150	1,470 [b]	-5	1,399 [b]
Family Practice	3,100	2,347	[c]	2,347
General Pediatrics and Subspecialties	4,950	2,122	[c] [d]	2,122 [d]
General Internal Medicine	3,550	6,729	[c]	6,729
Allergy and Immunology	1,000	65	-20	52
Cardiology	7,150	701	-20	561
Endocrinology	1,800	181	-20	145
Gastroenterology	400	367	0	367
Hematology/Oncology	(700)	472	+5	496
Infectious Diseases	1,000	202	-20	162
Nephrology	2,100	266	-20	213
Pulmonary Diseases	3,350	387	-20	310
Rheumatology	1,300	186	-20	149
Obstetrics/Gynecology	10,450	1,244	-20	995
*Neurology	3,150 *	437	0	437
Dermatology	400	282	0	282
Psychiatry	(8,000)	1,010	+20	1,212
Child Psychiatry	(4,900)	271	+20	325
General Surgery	11,800	2,817	-20	2,254
Neurosurgery	2,450	127	-20	102
Ophthalmology	4,700	505	-20	404
Orthopedic Surgery	5,000	684	-20	547
Otolaryngology	500	293	0	293
Plastic Surgery	1,200	202	-20	162
Thoracic Surgery	850	134	-10	121
Urology	1,650	293	-20	234
Emergency Medicine	(4,250)	225	N/A	400
Preventive Medicine	(1,750)	98	+20	118
Occupational/Aerospace	[e]	65	+20	78
*Anesthesiology	(1,550)*	675	+10	743
*Nuclear Medicine	N/A [f]*	118	0	118
*Pathology	3,350 *	735	-5	698
*Physical Med. & Rehab.	(800)*	159	+20	190
*Radiology	9,800 *	922	-20	738

N/A -- Not available

* The requirements in these six specialties were estimated crudely after a brief review of the literature. They should be considered approximations, and tentative. The full GMENAC modeling methodology will be applied to them in 1980-81.

[a] These figures include the filled positions exhibited in TABLE V.6, other than the flexible internships and osteopathic internships.

[b] The number for osteopathic residents include all trainees beyond the PGY-1 level.

[c] While the 1990 projected supply is slightly greater than requirements for all three of these specialties, GMENAC suggests that the current number of residency positions be retained in the 1980s in order to accommodate the anticipated surplus in the aggregate number of residents and physicians in 1990.

[d] It is suggested that the same number of positions be retained for the pediatric subspecialties until better data concerning their supply and training rates are available.

[e] Included as part of preventive medicine.

[f] The 1978 AMA masterfile does not include accurate estimates for nuclear medicine. Therefore, the supply estimates for nuclear medicine have been ommitted, and calculations of surplus, balance, or shortage cannot be made.

2. Supply Recommendations

In addition to the specialty-specific considerations discussed above and highlighted in Tables V.6 and V.7, the Modeling Panel found that the aggregate projected needs-supply comparison indicates a projected surplus (see Table V.2) which has to be dealt with in an aggregate level. As a result, the Modeling Panel of GMENAC has developed a series of recommendations for residency training as well as medical school enrollment and requirements for foreign medical graduates (both U.S. citizens and aliens). These recommendations were endorsed by GMENAC at its September 3, 1980 meeting and are contained below.

GMENAC MODELING PANEL RECOMMENDATIONS

RECOMMENDATION 1. No new allopathic or osteopathic medical schools should be established beyond those with first-year students in place in 1980-81.

RECOMMENDATION 2. There should be no increase in the entering class size into allopathic and osteopathic medical schools beyond the entering class of 1981.

RECOMMENDATION 3. Allopathic and osteopathic medical schools should reduce entering class size in the aggregate by a minimum of ten percent by 1984 relative to the 1978 figure.

RECOMMENDATION 4. The current health professions law, which authorizes grants to health professions schools for construction of teaching facilities, should be amended to allow the Secretary of the Department of Health and Human Services to grant waivers immediately to allopathic and osteopathic medical schools to allow them to ignore the law's requirement to increase enrollment. This recommendation applies as well to the pertinent Veterans Administration authorities under the Manpower Grants Program.

RECOMMENDATION 5. The current health professions law should be amended to allow the Secretary of the Department of Health and Human Services to waive immediately the requirement that allopathic and osteopathic medical schools, as a condition of receiving a capitation grant, maintain the first-year enrollment at the level of the preceding school year. This recommendation applies as well to the pertinent Veterans Administration authorities under the Manpower Grants Program.

RECOMMENDATION 6. The number of graduates of foreign medical schools entering the U.S. yearly, estimated to be 4,100 by 1983, should be severely restricted. If this cannot be accomplished, the undesirable alternative would be to further decrease the number of entrants to U.S. medical schools.

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RECOMMENDATION 7. Terminate all Federal and State assistance given through loans and scholarships to U.S. medical students initiating study abroad after the 1980-81 academic year.

RECOMMENDATION 8. Endorse current efforts in the private sector to immediately develop and implement a uniform qualifying examination for administration to U.S. citizens and aliens who graduated from medical schools other than those approved by the LCME, for entry into LCGME approved graduate training programs.

A. Such an examination must assure a standard of quality equivalent to the standard applied to graduates of LCME-accredited medical schools.

B. Specifically, such U.S. citizens and aliens must be required to successfully complete Parts I and II of the National Board of Medical Examiners examination or a comparable examination.

C. It is specifically recommended that the ECFMG examination not be used as the basis for measurement of the competence of USFMGs or alien physicians.

RECOMMENDATION 9. Require that alien physicians who have entered the United States on the basis of being spouses of U.S. citizens successfully complete Parts I and II of the National Board of Medical Examiners examination or a comparable examination prior to entry into residency training.

RECOMMENDATION 10. Ability to read, write and speak English should remain a requirement for graduate medical education programs for all alien physicians.

RECOMMENDATION 11. Urge the Federation of State Medical Boards to recommend (and the States to require) that, prior to obtaining unrestricted licensure, all applicants must have successfully completed at least one year of a GME program which has been approved by the LCGME and must have successfully passed an examination which assures a standard of quality, particularly in the ability to take medical histories, do physical examinations, carry out procedures, and develop diagnostic and treatment plans for patients, equivalent to the standard applied to graduates of United States medical schools.

RECOMMENDATION 12. Urge the States to restrict severely the number of individuals engaged in the practice of medicine who do not have an unlimited license. This applies to those practicing independently without a full license and to those practicing within an institution without adequate supervision.

RECOMMENDATION 13. Eliminate the "fifth Pathway" for entrance to approved programs of graduate medical education.

RECOMMENDATION 14. Eliminate the transfer of U.S. citizens enrolled in foreign medical schools into advanced standing in United States medical schools.

RECOMMENDATION 15. In view of the projected oversupply of physicians, the need to train nonphysician health care providers at current rates should be studied.

RECOMMENDATON 16. In view of the aggregate surplus of physicians projected in 1990, medical school graduates in 1980s should be strongly encouraged to (1) enter training in those specialties where a shortage of physicians is expected and (2) enter training in the generalist fields of family practice, general pediatrics, and general internal medicine.

RECOMMENDATION 17. To correct shortages or surpluses in a manner which would not be disruptive to the GME system, no specialty or subspecialty should be expected to increase or decrease the number of first-year trainees in residency or fellowship training programs more than 20 percent by 1986, compared to 1979.

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APPENDICES

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE MODELING PANEL

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE PHYSICIAN SPECIALTY DELPHI PANELS

APPENDIX I

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

MODELING PANEL

DONALDSON, William F., M.D.
(Convener)
Clinical Professor
Orthopedic Surgery
University of Pittsburgh
School of Medicine
Pittsburgh, Pennsylvania

MORGAN, Beverly C., M.D.
Chairman and Professor
Department of Pediatrics
University of Washington
Seattle, Washington

NESBITT, Tom E., M.D.
Urologist, Private Practice
Assistant Clinical Professor Urology
Vanderbilt University
Nashville, Tennessee

SPIVEY, Bruce E., M.D.
President
Pacific Medical Center
San Francisco, California

STELMACH, W. Jack, M.D.
(GMENAC Chairman, 1977-78)
Director
Family Practice Residency
Program
Baptist Memorial Hospital
Kansas City, Missouri

WILKINSON, Charles, B., M.D.
Executive Director
Greater Kansas City
Mental Health Foundation
Associate Dean
School of Medicine
University of Missouri
Kansas City, Missouri

FORMER PANEL MEMBERS

HOLDEN, William D., M.D.
Professor and Director,
Department of Surgery
Case Western Reserve University
School of Medicine
Cleveland, Ohio

LeMAISTRE, Charles A., M.D.
President
The University of Texas System
Cancer Center
Texas Medical Center
Houston, Texas

MAYER, William, M.D.
(Ex Officio)
Asst. Chief Medical
Director for Academic Affairs
Veterans Administration
Washington, D.C.

STAFF

JACOBY, Itzhak, Ph.D.
Staff Director, GMENAC
Director, Office of Graduate
Medical Education
Health Resources Administration
Department of Health and Human
Services
Hyattsville, Maryland

APPENDIX II

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

ADULT MEDICAL CARE AND INTERNAL MEDICINE SUBSPECIALTY

DELPHI PANELS

Adult Medical Care Panel

CONVENERS

TARLOV, Alvin R., M.D.
Professor and Chairman
Department of Internal Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

MAGEN, Myron S., D.O.
Dean and Professor of Pediatrics
Michigan State University
College of Osteopathic Medicine
East Lansing, Michigan

PANELISTS

Family Practice

BLOOM, Sanford, M.D.
Director, Family Practice Residency Program
Santa Monica Hospital Medical Center
Santa Monica, California

EGGER, Ross L., M.D.
Director, Family Practice Residency Program
Ball Memorial Hospital
Muncie, Indiana

JONES, James G., M.D.
Chairman, Department of Family Practice
East Carolina University
School of Medicine
Greenville, North Carolina

NIKOLAUS, Donald G., M.D.
Private Practice
Dunedin, Florida

POTTS, Donald, M.D.
Private Practice
Independence, Missouri

REPPART, John, M.D.
Col., MC, USAF
David Grant USAF Medical Center
Travis AFB, California

RUSCO, Ralph, D.O.
Private Practice
Chicago, Illinois

SCHACKELFORD, Robert, M.D.
Group Practice
Mount Olive, North Carolina

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

ADULT MEDICAL CARE AND INTERNAL MEDICINE SUBSPECIALTY

DELPHI PANELS (Cont'd)

Internal Medicine

BRISTOW, Lonnie R., M.D.
Private Practice
San Pablo, California

BYYNY, Richard, M.D.
Professor of Medicine
Health Science Center
University of Colorado
Denver, Colorado

DAVIES, Nicholas E., M.D.
Private Practice
Atlanta, Georgia

DAVIS, William D., Jr., M.D., F.A.C.P.
Professor of Clinical Medicine
Tulane University
Chairman Emeritus, Department of Internal Medicine
Ochsner Foundation Hospital
New Orleans, Louisiana

DuPREE, Richard H., M.D.
Private Practice
Haddonfield, New Jersey

WALDMAN, Robert H., M.D.
Professor and Chairman
Department of Medicine
West Virginia University
School of Medicine
Morgantown, West Virginia

Other Specialties

Preventive Medicine

SCHOENRICH, Edyth, M.D.
Associate Dean
Johns Hopkins School of Hygiene and Public Health
Baltimore, Maryland

Nonphysician Health Care Providers

JOYNER, Steven, P.A.
Physician's Assistant in Family Practice
Dixon Medical Center, Inc.
Ayden, North Carolina

MULLINIX, Connie, M.P.H.
Assistant Professor and Family Nurse Practitioner
University of Wisconsin/Milwaukee
School of Nursing
Milwaukee, Wisconsin

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

ADULT MEDICAL CARE AND INTERNAL MEDICINE SUBSPECIALTY

DELPHI PANELS (Cont'd)

INTERNAL MEDICINE SUBSPECIALTY PANELISTS

Allergy

HOUSER, D. Duane, M.D.
Private Practice
Indianapolis, Indiana

RICHERSON, Hal B., M.D.
Director, Allergy and
Immunology Division
Department of Internal Medicine
University of Iowa Hospital
Iowa City, Iowa

ZEITZ, Howard, M.D.
Associate Director
Institute of Allergy and
Clinical Immunology
Grant Hospital
Assistant Professor of Immunology
Rush Medical College
Chicago, Illinois

Cardiology

GOLDBARG, Alberto, M.D.
Chief, Cardiac Surveillance Unit
Michael Reese Medical Center
Chicago, Illinois

HAMMERMEISTER, Karl E., M.D.
Veterans Administration Hospital
Seattle, Washington

ROMERO, Calixto, M.D.
Texoma Cardiology Associates
Consultant in area hospitals
Denison, Texas

VANDEN BELT, Ron J., M.D.
Clinical Assistant Professor of
Internal Medicine (Cardiology)
University Hospital
Ann Arbor, Michigan

Endocrinology

KAMMER, Huldrick, M.D.
Professor of Medicine
Department of Endocrinology
and Metabolism
University of Oregon Medical
School
Associate Director
Department of Medical Education
Providence Medical Center
Portland, Oregon

KREINES, Kenneth, M.D.
Professor of Clinical Medicine
University of Cincinnati
Cincinnati, Ohio

INTERNAL MEDICINE SUBSPECIALTY PANELISTS (Cont'd)

Gastroenterology

CASSEL, Chester, M.D.
Clinical Professor of Medicine
University of Miami
Miami, Florida

FALL, Daniel, M.D.
Clinical Associate Professor
of Internal Medicine
University of Michigan
Ann Arbor, Michigan

McGILL, Douglas, M.D.
Professor of Medicine
Chairman, Division of
Gastroenterology
Mayo Medical School
Rochester, Minnesota

Hematology/Oncology

GOLDSMITH, Jonathan C., M.D.
Assistant Professor
Division of Hematology/Oncology
Department of Internal Medicine
College of Medicine
University of Iowa
Iowa City, Iowa

HUTTON, John J., M.D.
Chief, Medical Services
Veterans Administration
Medical Center
Lexington, Kentucky

PIEL, Ira J., M.D.
Clinical Assistant Professor
of Medicine
Abraham Lincoln School of
Medicine
University of Illinois
Chicago, Illinois

SHAPIRO, Charles, M.D.
Clinical Professor of Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

Infectious Disease

BEATY, Harry M., M.D.
Chief of Medical Service
Department of Medicine
University of Vermont
Burlington, Vermont

POCOCK, Donald A., M.D.
Massillon Clinic
Massillon, Ohio

SCHIFF, Gilbert M., M.D.
Director, Christ Hospital Institute
of Medical Research
Professor of Medicine
University of Cincinnati
College of Medicine
Cincinnati, Ohio

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

ADULT MEDICAL CARE AND INTERNAL MEDICINE SUBSPECIALTY

DELPHI PANELS (Cont'd)

INTERNAL MEDICINE SUBSPECIALTY PANELISTS (Cont'd)

Nephrology

BLAGG, Christopher, M.D.
Professor of Medicine
University of Washington
School of Medicine
Seattle, Washington

BUCKALEW, Vardaman, Jr., M.D.
Chief, Section on Nephrology
Bowman Gray School of Medicine
Wake Forest University
Winston-Salem, North Carolina

RAPPAPORT, Martin, M.D.
Doctors' Clinic
Webster, Texas

Pulmonary Disease

ADDINGTON, Whitney W., M.D.
Professor of Medicine and
Head of the Pulmonary Section
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

BIRD, Richard, M.D.
Col., MC, USAF
USAF Medical Center
Scott AFB, Illinois

NEVIN, William S., M.D.
Adjunct Assistant Professor
Arizona Medical Center
University of Arizona
Tucson, Arizona

Rheumatology

KATZ, Robert, M.D.
Assistant Professor of
Medicine
Rush Medical College
Chicago, Illinois

PEARSON, Carl M., M.D.
Director, Division of
Rheumatology
Department of Medicine
UCLA School of Medicine
Los Angeles, California

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

ADULT MEDICAL CARE AND INTERNAL MEDICINE SUBSPECIALTY

DELPHI PANELS (Cont'd)

INTERNAL MEDICINE SUBSPECIALTY PANELISTS (Cont'd)

Staff

JACOBY, Itzhak, Ph.D.
Staff Director, GMENAC
Director, Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

AUMACK, Lewis, Ph.D.
Social Science Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

ROSENSTEIN, Judy, M.H.S.A.
Program Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

CHILD MEDICAL CARE AND PEDIATRIC SUBSPECIALTY

DELPHI PANEL

Convener

DONALDSON, William F., M.D.
Clinical Professor
Orthopedic Surgery
University of Pittsburgh
School of Medicine
Pittsburgh, Pennsylvania

CHILD MEDICAL CARE PANELISTS

Pediatrics

CHAPMAN, Daniel D., M.D.
Clinical Associate
Department of Pediatrics
University of Michigan
Child Health Associates
Ann Arbor, Michigan

GAFFNEY, Paul C., M.D.
Medical Director and
Professor of Pediatrics
Children's Hospital
Pittsburgh, Pennsylvania

HANNEMANN, Robert E.
Professor of Pediatric Diagnosis
Indiana University Medical College
Pediatrician, Arnett Clinic
Lafayette, Indiana

RICHARDSON, Martyn E., D.O.
Professor and Chairman
Department of Pediatrics
Associate Dean for Clinic Affairs
West Virginia School of
Osteopathic Medicine
Lewisburg, West Virginia

SMITH, Martin H., M.D.
Pediatrician
Private Practice
Gainesville, Georgia

Family Practice

COWAN, Seth, M.D.
Family Practice Clinic
Garland, Texas

YOUNG, Paul R., M.D.
Professor and Chairman
Department of Community Health and
Family Practice
University of Nebraska
College of Medicine
Omaha, Nebraska

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

CHILD MEDICAL CARE AND PEDIATRIC SUBSPECIALTY

DELPHI PANEL (Cont'd)

CHILD MEDICAL CARE (Cont'd)

Preventive Medicine

FOWINKLE, Eugene, M.D., M.P.H.
Commissioner of Public Health
State of Tennessee
Department of Public Health
Nashville, Tennessee

Nonphysician Health Care Providers

CHOW, Marilyn
Nurse Practitioner
Administrative Assistant
Nursing Service
Children's Hospital
Chairperson, Council for Primary Health Care Nurse Practitioners
San Francisco, California

COMPANIOTTE, Trudy, C.P.A.
Certified Physician Assistant
Shelbyville, Tennessee

PEDIATRIC SUBSPECIALTY PANELISTS

Pediatric Allergy

DOCKHORN, Robert J., M.D.
Director, Allergy and Clinical Immunology Teaching Program
University of Kansas School of Medicine
Kansas City, Kansas

Pediatric Cardiology

GESSNER, Ira H., M.D.
Professor of Pediatrics
Department of Pediatrics
University of Florida College of Medicine
Gainesville, Florida

Pediatric Endocrinology

MAHONEY, Patrick C., M.D.
The Mason Clinic
Clinical Professor of Pediatrics
University of Washington
School of Medicine
Seattle, Washington

Pediatric Hematology/Oncology

STOCKMAN, James, M.D.
Associate Professor of Pediatrics
State University of New York
Upstate Medical Center
Syracuse, New York

Neonatal-Perinatal Medicine

MAISELS, M. Jeffrey, M.D.
Associate Professor of Pediatrics and
Chief, Division of Neonatal Obstetrics/Gynecology
Department of Pediatrics
Milton S. Hershey Medical Center
Pennsylvania State University
Hershey, Pennsylvania

PEDIATRIC SUBSPECIALTY PANELISTS (Cont'd)

Pediatric Nephrology

EDELMANN, Chester M., Jr., M.D.
Attending Pediatrician
Hospital of the Albert Einstein
College of Medicine
Montefiore Hospital
Lincoln Hospital
Bronx Municipal Hospital Center
New York City, New York

Staff

KATZOFF, Jerald M.
Supervisory Operations Research Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

GOLDSTROM, Ingrid, M.A.
Program Analyst
Office of Graduate Medical Education
Department of Health and Human Services
Hyattsville, Maryland

THORNER, Robert N.
Social Science Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

DERMATOLOGY DELPHI PANEL

Conveners

SPIVEY, Bruce E., M.D.
(Convener)
President, Pacific Medical Center
San Francisco, California

HERTZOG, Francis C., Jr., M.D.
(Co-convener)
Chairman, Board of Directors
Memorial Hospital Medical Center
University of California at Irvine
Long Beach, California

Panelists

BAXT, Saida, M.D.
(Dermatology)
Private Practice
Saddle River, New Jersey

GUREVITCH, Arnold W., M.D.
(Dermatology)
Adjunct Associate Professor of Medicine
UCLA School of Medicine
Los Angeles, California

LOWNEY, Edmund D., M.D.
(Dermatology)
Professor of Medicine and
Director, Division of Dermatology
College of Medicine
Ohio State University
Columbus, Ohio

MATHIES, Allen W., M.D., Ph.D.
(Pediatrics)
Dean, School of Medicine
Senior Attending Physician in Pediatrics
University of Southern California
Los Angeles, California

NICHOLAS, Thomas A., M.D.
(Family Practice)
Director, Division of Education
American Academy of Family Practice
Kansas City, Missouri
and
Clinical Professor
Department of Family Practice
Texas Tech University School of Medicine
Lubbock, Texas

THOMPSON, Paul A., M.D.
(General Internal Medicine)
Group Practice
Memphis, Tennessee

Staff

RODDY, Pamela, Ph.D.
Health Scientist Administrator
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

RUDZINSKI, Karen A., M.A.
Program Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

EMERGENCY MEDICINE DELPHI PANEL

Convener

DONALDSON, William F., M.D.
Clinical Professor
Orthopedic Surgery
University of Pittsburgh
School of Medicine
Pittsburgh, Pennsylvania

Panelists

ANZINGER, Robert, M.D.
(Emergency Medicine)
Treasurer, EMSCO, Ltd.
serving Ingalls Memorial
Hospital Emergency Department
River Forest, Illinois

DOVER, Marion, R.N.
(Emergency Medicine)
Director of Nursing Service
Androscoggin Valley Hospital
Berlin, New Hampshire

FLESSA, Herbert, M.D.
(Internal Medicine)
Professor of Medicine
University of Cincinnati
Medical Center
Cincinnati, Ohio

FOUTY, William, M.D.
(Trauma Surgery)
Chairman, Department of
Surgery
Washington Hospital Center
Washington, D.C.

GAFFNEY, Paul, M.D.
(Pediatrics)
Medical Director and Professor
of Pediatrics
Children's Hospital
Pittsburgh, Pennsylvania

HARWOOD, Ann, M.D.
(Emergency Medicine)
Medical Staff (Emergency Medicine)
University of Chicago
Hospitals and Clinics
Chicago, Illinois

LAPHAM, Robert, P.A.
(Emergency Medicine)
Staff Physician Assistant
Department of Emergency
Medicine
Maine Medical Center
Portland, Maine

RASMUSSEN, Holger, M.D.
(Family Practice)
Private Practice
Fremont, California

SABATIER, Henry Stewart, Jr., M.D.
(Emergency Medicine)
Director, Emergency Medicine Services
Professor, Emergency Medicine and
of Surgery
Johns Hopkins University
School of Medicine
Baltimore, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

EMERGENCY MEDICINE DELPHI PANEL (Cont'd)

Panelists (Cont'd)

SLABY, Andrew E., M.D., Ph.D.
(Psychiatry)
Physician-in-Chief, Department of Psychiatry
Consultant, Department of Medicine
Rhode Island Hospital
Providence, Rhode Island

TOMALNOVICH, Michael C., M.D.
(Emergency Medicine)
Director, Emergency Medicine Residency Program, Division of Emergency Medicine
Henry Ford Hospital
Clinical Instructor
Department of Internal Medicine
University of Michigan
School of Medicine
Ann Arbor, Michigan

WIEGENSTEIN, John Gerald, M.D.
(Emergency Medicine)
Clinical Professor
Department of Medicine
Michigan State University
College of Human Medicine
East Lansing, Michigan

Staff

KATZOFF, Jerald M.
Supervisory Operations Research Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

ISSEN, Gail F., M.S.W.
Social Science Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

NEUROSURGERY DELPHI PANEL

Convener

STELMACH, W. Jack, M.D.
Director, Family Practice
Residency Program
Baptist Memorial Hospital
Kansas City, Missouri

Panelists

BARR, Joseph S., M.D.
(Orthopedic Surgery)
Associate Orthopaedic Surgeon
Faulkner Hospital
New England Baptist Hospital
Chief, Amputation Clinic
Massachusetts General Hospital
Boston, Massachusetts

CHOU, Shelley, N., M.D., Ph.D.
(Neurosurgery)
Head, Department of Neurosurgery
University of Minnesota Hospitals
Minneapolis, Minnesota

KARTCHNER, Mark M., M.D.
(General and Vascular Surgery)
Private Practice
Tucson, Arizona

SIBLEY, William A., M.D.
(Neurology)
Professor and Head
Department of Neurology
Arizona Health Services Center
Tucson, Arizona

SCHUT, Luis, M.D.
(Neurosurgery)
Chief, Neurosurgery Service
Children's Hospital
Professor of Neurosurgery
University of Pennsylvania
School of Medicine
Philadelphia, Pennsylvania

SKOGLUND, Russell R., M.D.
Cap., MC, USN
(Pediatric Neurology)
Navy Regional Medical Center
San Diego, California

SLATER, Roger, M.D.
(Neurosurgery)
Assistant Clinical Professor
of Neurological Surgery
University of California
College of Medicine at Irvine
Long Beach, California

THOMPSON, John, M.D.
(Neurosurgery)
Clinical Associate Professor of
Neuroanatomy
Vice Chief of Staff
Bayfront Medical Center
St. Petersburgh, Florida

WATTS, Clark, M.D.
(Microneurosurgery)
Professor of Surgery
Chief, Division of Neurological
Surgery
University of Missouri Medical Center
Columbia, Missouri

NEUROSURGERY DELPHI PANEL (Cont'd)

Staff

Battelle Memorial Institute
Human Affairs Research Centers
Seattle, Washington

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

OBSTETRICS-GYNECOLOGY DELPHI PANEL

Conveners

TARLOV, Alvin R., M.D.
Professor and Chairman
Department of Internal Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

SPURLOCK, Jeanne, M.D.
Deputy Medical Director
American Psychiatric Association
Clinical Professor of Psychiatry
Schools of Medicine
George Washington and
Howard Universities
Washington, D.C.

Panelists

ANDREWS, William, M.D.
(Obstetrics-Gynecology)
Professor, Obstetrics-Gynecology
Eastern Virginia Medical School
Norfolk, Virginia

HELLMAN, Louis, M.D.
Obstetrics-Gynecology
Director, Medical Information Services
Population Reference Bureau
Washington, D.C.

JONES, James G., M.D.
(Family Medicine)
Associate Professor of Family Medicine
University of North Carolina
School of Medicine
Chapel Hill, North Carolina and
Chairman, Department of Family Medicine
East Carolina University
School of Medicine
Greenville, North Carolina

KERR, Charlotte H., M.D., F.A.C.S., F.A.C.O.G.
(Obstetrics-Gynecology)
Attending Physician in Gynecology
Lake Seminole Hospital
Seminole, Florida and
Gynecology Consultant
Veterans Administration Hospital
Bay Pines, Florida

NICKEL, James, M.D.
(Obstetrics-Gynecology)
Private Practice
Helena, Montana

LANG, Dorothea, C.N.M., M.P.H.
(Midwifery)
Director, Midwifery Services Program-Maternity, Infant Care/Family Planning Projects
City of New York
New York, New York

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

OBSTETRICS-GYNECOLOGY DELPHI PANEL (Cont'd)

Panelists (Cont'd)

PEARSE, Warren Harland, M.D.
(Obstetrics-Gynecology)
Executive Director
American College of Obstetrics-Gynecology
Chicago, Illinois

SWENSON, Norma, M.P.H.
Administrative Officer and Assistant Administrator
Boston Women's Health Book Collective, Inc.
Watertown, Massachusetts

Staff

RUDZINSKI, Karen A., M.A.
Program Analyst
Director, Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

RODDY, Pamela, PH.D.
Health Scientist Administrator
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

Ophthalmology Delphi Panel

Convener

STELMACH, W. Jack, M.D.
Director, Family Practice Residency Program
Baptist Memorial Hospital
Kansas City, Missouri

Panelists

BALL, Richard, O.D.
(Optometry)
Associate Professor in Physiology
Michigan State University
College of Human Medicine
East Lansing, Michigan, and
Private Practice
Owosso, Michigan

BOUCH, G. Ray, M.D.
(Family Practice)
Group Practice
Long Beach, California

BOYD, Herschell, M.D.
(Ophthalmology)
Intraoccular Lens Implans Surgery
Overlake Memorial Hospital, and
Private Practice
Bellevue, Washington

CLAUSSEN, Larry, O.D., M.P.H.
(Optometry)
Assistant Dean for Administrative Affairs
College of Optometry
Pacific University
Forest Grove, Orgeon

EDWARDS, Adrian L., M.D. F.A.C.P.
(Internal Medicine and Cardiology)
Clinical Assistant Professor of Medicine
Cornell University Medical College
New York, New York

GANLEY, James, M.D.
(Ophthalmology)
Assistant Professor
Division of Ophthalmology
University of Arizona
Health Sciences Center
Tucson, Arizona

KAHN, Lawrence, M.D.
(Pediatrics)
Professor of Pediatrics
Director, Pediatric Nurse Practitioner Program
Associate, Division of Health Care Research
Washington University
School of Medicine
St. Louis, Missouri

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

Ophthalmology Delphi Panel (Cont'd)

Panelists (Cont'd)

LICHTENSTEIN, David P., M.D.
(Internal Medicine)
Assistant Professor
Department of Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

REINECKE, Robert, D., M.D.
(Ophthalmology)
Chairman, Department of Ophthalmology
Albany Medical College
Union University
Albany, New York

STEINBERG, Theodore, M.D., F.A.C.S.
(Ophthalmology)
Adjunct Professor of Ophthalmoolgy
California State University at Fresno
Fresno, California

WILSON, Everett E., D.O.
(Ophthalmology)
Professor of Ophthalmology
Ohio University College of
Osteopathic Medicine
Athens, Ohio

Staff

Battelle Memorial Institute
Human Affairs Research Centers
Seattle, Washington

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

ORTHOPEDIC SURGERY DELPHI PANEL

Convener

NESBITT, Tom E., M.D.
Urologist, Private Practice
Assistant Clinical Professor Urology
Vanderbilt University
School of Medicine
Nashville, Tennessee

Panelists

DUKE, James A., Jr., M.D.
(General Surgery)
University of Texas Medical
School at Houston
Texas Medical Center
Houston, Texas

FELMLEE, Edward, D.O.
Orthopedic and Traumatic Surgery)
Private Practice
Orthopedics, Inc.
Tulsa, Oklahoma

GEISE, August W., M.D.
(Neurosurgery)
Private Practice
St. Louis, Missouri

HEALEY, Louis Andrew, M.D.
(Internal Medicine-
Rheumatology)
Virginia Mason Clinic
Seattle, Washington

HENDERSON, M.D.
(Orthopedic Surgery)
Private Practice
Rochester, Minnesota

McGLAMRY, E. Dalton, D.P.M., F.A.C.S.
(Podiatric Surgery)
Private Practice
Rucker, Georgia

OKAMOTO, Gary, M.D., M.P.H.
(Physical Medicine and
Rehabilitation)
Assistant Professor
Physician Medicine and Rehabilitation
Adjunct Professor, Pediatrics
University of Washington
School of Medicine
Seattle, Washington

ROME, Leonard P., M.D.
(Pediatrics)
Associate Clinical Professor
Case Western Reserve University
School of Medicine
Chairman, Pediatric Allergy
Mt. Sinai Hospital of Cleveland
Cleveland, Ohio

SCHMID, Frank R., M.D.
(Internal Medicine-Rheumatology
Professor of Medicine and Chief,
Section of Arthritis and
Connective Tissue Diseases
Department of Medicine
Northwestern University Medical School
Chicago, Illinois

SHOEMAKER, Robert C., M.D.
(Orthopedic Surgery)
Private Practice
Charlestown, New Hampshire

ORTHOPEDIC DELPHI PANEL (Cont'd)

Panelists (Cont'd)

SMILKSTEIN, Gabriel, M.D.
(Family Practice)
Associate Professor of Family Medicine
Department of Family Medicine
University of Washington
School of Medicine
Seattle, Washington

STAHELI, Lynn T., M.D.
(Pediatric Orthopedic Surgery)
Director, Department of Orthopedics
Children's Orthopedic Hospital and Medical Center
Seattle, Washington

STARK, Herbert H., M.D.
(Orthopedic Surgery)
Private Practice--Hand Surgery
Los Angeles, California

VECCHIONE, Thomas, M.D.
(Plastic Surgery)
Chief, Plastic Surgery Division
Children's Hospital, and
Clinical Assistant Professor of Surgery
Division of Plastic Surgery
University of California
San Diego, California

Staff

Battelle Memorial Institute
Human Affairs Research Centers
Seattle, Washington

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

OTOLARYNGOLOGY DELPHI PANEL

Convener

DONALDSON, William F., M.D.
Clinical Professor
Orthopedic Surgery
University of Pittsburgh
School of Medicine
Pittsburgh, Pennsylvania

Panelists

BALES, Gertrude A., M.D.
(Otolaryngologist)
Clinical Assistant Professor
Otolaryngology
Strong Memorial Hospital
Rochester, New York

BEAR, Elmer S., D.D.S.
(Oral and Maxillofacial Surgeon)
Clinical Professor of Dentistry
Division of Dentistry and
Professor of Surgery
Department of Medicine
Medical College of Virginia
University of Virginia
Richmond, Virginia

BOLES, Roger, M.D.
(Otolaryngologist)
Professor and Chairman
Department of Otolaryngology
University of California
School of Medicine
San Francisco, California

CALL, William H., M.D.
(Otolaryngologist)
Private Practice
Lakewood Otolaryngologic Clinic, P.C.
Lakewood, Colorado

CANTRELL, Robert, M.D.
(Otolaryngologist)
Fitz Hugh Professor and Chairman
Department of Oral and
Maxillofacial Surgery
Medical College of Virginia
Charlottesville, Virginia

CORPRON, Douglas, M.C.
(Family Practice)
Director of Family Practice
Residency Program
Yakima, Washington
Associate Professor
Department of Family Medicine
University of Washington
School of Medicine
Seattle, Washington

ELLIOTT, Ray A., Jr., M.D.
Clinical Associate Professor
of Plastic Surgery
Clinical Associate Professor of
Orthopaedic Surgery (Hand)
Albany Medical College of Union
University
Albany, New York

Otolaryngology Delphi Panel (Cont'd)

Panelists (Cont'd)

FELDMAN, Alan S., Ph.D.
(Audiology)
Professor and Director
Communication Disorders Unit
State University of New York
Upstate Medical Center
College of Medicine
Syracuse, New York

LEWIS, Ceylon S., Jr., M.D.
(Internal Medicine)
Clinical Professor of Medicine
University of Oklahoma
Tulsa Medical College
Tulsa, Oklahoma

PRATT, Loring W., M.D.
(Otolaryngologist)
Chairman, Department of Otolaryngology and Maxillofacial Surgery
Mid-Maine Medical Center and
Director, F.T. Hill Center for Communication Disorders
Colby College
Waterville, Maine

ROBERTS, Kenneth B., M.D.
(Pediatrics)
Assistant Professor of Pediatrics
Johns Hopkins University
Clinical Assistant Professor
Department of Pediatrics
University of Maryland
Associate Pediatrician-in-Chief
Sinai Hospital of Baltimore
Baltimore, Maryland

WILHELM, Morton C., M.D.
(General Surgeon)
Clinical Associate Professor of Surgery
University of Virginia
School of Medicine
Charlottesville, Virginia

Staff

Battelle Memorial Institute
Human Affairs Research Centers
Seattle, Washington

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

PREVENTIVE MEDICINE DELPHI PANEL

Conveners

TARLOV, Alvin R., M.D.
Professor and Chairman
Department of Internal Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

CARBECK, Robert B., M.D.
Executive Vice President
Catherine McCauley Health Center
Ann Arbor, Michigan

Panelists

BERGNER, Lawrence, M.D.
Affiliate Professor of Health Services
University of Washington
School of Public Health
Seattle, Washington

BIGGS, Bee, R.N.
Assistant State Health Officer
State of Idaho Health Department
Boise, Idaho

BRIDBORD, Kenneth, M.D.
Director, Office of Extramural
Coordination and Special Projects
National Institute for
Occupational Safety and Health
Center for Disease Control
Department of Health and Human
Services
Rockville, Maryland

CASSUTO, Jerry, M.D.
General Medical Director
Western Electric Company, Inc.
Human Resources and
Labor Relations Division
Greensboro, North Carolina

GUARNIRI, Susan R., M.D.
Assistant Commissioner for
Clinical Services
Baltimore City Health Department
Baltimore, Maryland

NICOGOSSIAN, Arnauld, M.D.
Manager, Operational Medicine
Life Sciences Division
National Aeronautics and Space
Administration
Washington, D.C.

NOVICK, Lloyd F., M.D.
Commissioner of Health
Vermont State Department of
Public Health
Burlington, Vermont

SCHOENRICH, Edyth, M.D.
Associate Dean
Johns Hopkins University
School of Hygiene and Public Health
Baltimore, Maryland

WAY, Anthony, M.D., Ph.D.
Associate Professor
Department of Preventive Medicine
and Community Health
Texas Tech University School
of Medicine
Lubbock, Texas

PREVENTIVE MEDICINE DELPHI PANEL (Cont'd)

Staff

CUCA, Janet M., M.A.
P.H.S. Staff Fellow
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

GENERAL PSYCHIATRY AND CHILD PSYCHIATRY DELPHI PANEL

General Psychiatry

Convener

TARLOV, Alvin R., M.D.
Professor and Chairman
Department of Internal Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

Panelists

COWART, Marolyn, M.D.
(Family Medicine)
Associate Professor of Family Medicine
Department of Family Practice
University of Miami
Miami, Florida

DRIPS, William, M.D.
(General Internal Medicine)
Group Practice
Salem, Oregon

ENZER, Norbert, M.D.
(Child Psychiatry)
Professor and Chairman
Department of Psychiatry
Michigan State University
East Lansing, Michigan

FREY, Henry, M.D.
(Psychiatry)
Private Practice
Denver, Colorado

GAFFNEY, Paul, M.D.
(Pediatrics)
Medical Director and Professor of Pediatrics
Children's Hospital
Pittsburgh, Pennsylvania

GEDAN, Sharon, R.N., M.S.
(Nurse psychotherapy)
Los Angeles, California

GRANATIR, William, M.D.
(Psychoanalysis)
Private Practice
Washington, D.C.

LAWSON, Billie, M.A., M.S.W.
(Psychiatric Social Worker)
Chief Social Worker
Inpatient Psychiatry
Harborview Medical Center
Seattle, Washington

NADELSON, Carol, M.D.
(Psychiatry)
Department of Psychiatry
Tufts-New England Medical Center Hospital
Boston, Massachusetts

PLAUT, Eric, M.D.
(psychiatry)
Commissioner, Connecticut Department of Mental Health
Hartford, Connecticut

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GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

GENERAL PSYCHIATRY AND CHILD PSYCHIATRY DELPHI PANEL

General Psychiatry (Cont'd)

Panelists (Cont'd)

SECHREST, Lee, Ph.D.
(Clinical Psychology)
Professor of Psychology
Florida State University
Tallahassee, Florida

TUCKER, Gary, M.D.
(Psychiatry/Neurology)
Chairman, Department of Psychiatry
Dartmouth Medical School
Hanover, New Hampshire

Child Psychiatry Delphi Panel

Panelists

EGAN, James, M.D.
(Child Psychiatry)
Chairman, Department of Psychiatry
Children's Hospital National
Medical Center
Washington, D.C.

ENZER, Norbert, M.D.
(Child Psychiatry)
Professor and Chairman
Department of Psychiatry
Michigan State University
East Lansing, Michigan

GAFFNEY, Paul, M.D.
(Pediatrics)
Medical Director and Professor
of Pediatrics
Children's Hospital
Pittsburgh, Pennsylvania

PAKULA, Larry, M.D.
(Pediatrics)
Private Practice
Timomium, Maryland

REIDY, Mary, Ph.D.
(Child Psychology)
Professor, Department of Psychiatry
Georgetown University
School of Medicine
Washington, D.C.

WEBSTER, Thomas G., M.D.
(Child Psychiatry)
Professor of Psychiatry and
Behavioral Sciences
George Washington University
School of Medicine
Washington, D.C.

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

GENERAL PSYCHIATRY AND CHILD PSYCHIATRY DELPHI PANEL

Child Psychiatry Delphi Panel (Cont'd)

Panelists (Cont'd)

HERSH, Stephen, M.D., F.A.P.A.
(Child Psychiatry)
Director, Division of Child and Adolescent Services
Saint Elizabeth's Hospital
Washington, D.C.

Staff

RUDZINSKI, Karen A., M.A.
Program Analyst
Office of Graduate Medical Education
Health Resorces Administration
Department of Health and Human Services
Hyattsville, Maryland

GOLDSTROM, Ingrid, M.S.
Program Analyst
Office of Graduate Medical Education
Health Resorces Administration
Department of Health and Human Services
Hyattsville, Maryland

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GENERAL SURGERY DELPHI PANEL

Conveners

TARLOV, Alvin R., M.D.
(Convener)
Professor and Chairman
Department of Internal Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

SPURLOCK, Jeanne, M.D.
(Co-convener)
Deputy Medical Director
American Psychiatric Association
Clinical Professor, Psychiatry
George Washington and
Howard University
Schools of Medicine
Washington, D.C.

Panelists

BUTCHER, Harvey R., M.D.
(General Surgery)
Professor of Surgery and
Driector, Division of Tumor
Serivce
Washington University
School of Medicine
St. Louis, Missouri

DERMONDY, William H., M.D.
(Internal Medicine)
Private Practice
Rochester, New York

GALLAGHER, Donald M., M.D.
(Colon and Rectal Surgery)
Associate Clinical Professor
of Surgery
University of California
Medical Center
San Francisco, California

GAREIS, Frank J., M.D.
(Pediatrics)
Capt., MC, USN
Department of Pediatrics
Naval Regional Medical Center
Oakland, California

HOLCOMB, George W., M.D.
(Pediatric General Surgery)
Pediatric General Surgeon
Private Practice
Nashville, Tennessee

JENSEN, Richard Lee, D.O.
(General Surgery-Obstetrics-
Gynecology)
Chicago Osteopathic Medical
Center
Adjunct Professor of Surgery
Chicago, Illinois

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GENERAL SURGERY DELPHI PANEL (Cont'd)

Panelists (Cont'd)

LAWS, Henry L., M.D.
(General Surgery)
Surgeons Assistant Program
Univeristy of Alabama Medical Center
Birmingham, Alabama

REPPART, John, M.D.
Col., MC, USAF
(Pediatrics)
David Grant USAF Medical Center
Travis AFB, California

ZUIDEMA, George, M.D.
(General Surgery)
Chairman and Surgeon-in-Chief
Johns Hopkins Hospital
Baltimore, Maryland

Staff

Battelle Memorial Institute
Human Affairs Research Centers
Seattle, Washington

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PLASTIC SURGERY DELPHI PANEL

Conveners

MORGAN, Beverly C., M.D.
Chairman, Department of Pediatrics
University of Washington
School of Medicine
Seattle, Washington

GARCIA, Delores, M.D.
Chief Resident in Pediatrics
Department of Pediatrics and
Communicable Diseases
University of Michigan Medical
Center
Ann Arbor, Michigan

Panelists

BAILEY, Byron, M.D.
(Otolaryngology)
Wiess Professor and Chairman
Department of Otolaryngology
University of Texas
Medical Branch at Galveston
Galveston, Texas

EADE, Gilbert G., M.D.
(Plastic Surgery)
Private Practice
Seattle, Washington

GOIN, John, M.D.
(Plastic Surgery)
Private Practice
Los Angeles, California

HEIMBACH, David, M.D.
(General Surgery--Burns)
Director, Burn Center
Harborview Medical Center and
Associate Professor of Surgery
University of Washington
School of Medicine
Seattle, Washington

HENDERSON, Edward D., M.D.
(Orthopedic Surgery--Hands)
Professor of Orthopedics
Mayo Medical School
Rochester, Minnesota

HUGO, Norman, M.D.
(Plastic Surgery)
Associate Professor of Surgery
Northwestern University
College of Medicine
Chicago, Illinois

KELLY, David D., D.D.S.
(Oral Surgery)
Private Practice
Charlotte, North Carolina

KLINGBEIL, Jerome, M.D.
(Plastic Surgery)
Associate Clinical Professor
Department of Surgery (Plastic)
University of California at Irvine
California College of Medicine
Irvine, California

McCORMACK, Robert, M.D.
(Plastic Surgery)
Chief Surgeon in Plastic Surgery
Clinical Director, Burn Unit
Strong Memorial Hospital
Rochester, New York

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

PLASTIC SURGERY DELPHI PANEL (Cont'd)

Panelists (Cont'd)

PANTZER, John G., Jr., M.D.
(Plastic Surgery)
Clinical Assistant professor of Surgery
Department of Plastic Surgery
Inidana University
School of Medicine
Indianapolis, Indiana

WAY, Barbara, M.D.
(Dermatology
Associate Professor and Chairperson
Department of Dermatology
Texas Tech University
Health Sciences Center
Lubbock, Texas

WERGELAND, Floyd, Dr.
Col, MC, USA
(Ophthalmology)
Ophthalmology Service
Walter Reed Army Medical Center
Washington, D.C.

Staff

Battelle Memorial Institute
Human Affairs Research Centers
Seattle, Washington

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

THORACIC SURGERY DELPHI PANEL

Convener

MORGAN, Beverly C., M.D.
Professor and Chairman
Department of Pediatrics
University of Washington
School of Medicine
Seattle, Washington

Panelists

ADKINS, Paul C., M.D.
(Thoracic Surgery)
Chairman and Professor of
Surgery
Department of Surgery
George Washington University
School of Medicine
Washington, D.C.

ALLEN, John M.D.
(Internal Medicine and
Pulmonary Disease)
Clinical Professor of Medicine
University of Washington
School of Medicine
Seattle, Washington

BAHNSON, Henry T., M.D.
(Thoracic Surgery)
Professor and Chairman
Department of Surgery
University of Pittsburgh
Pittsburgh, Pennsylvania

BARTLEY, Thomas D., M.D.
(Thoracic Surgery)
Staff, Alachuca General
Gainesville, Florida

HAMMERMEISTER, Karl E., M.D.
(Cardiology)
Veterans Administration Hospital
Seattle, Washington

LIDDLE, Harold V., M.D.
(Thoracic Surgery)
Clinical Professor of Surgery
University of Utah
College of Medicine
Salt Lake City, Utah

MILLER, William Weaver, M.D.
(Pediatric Cardiology)
Professor of Pediatrics
Medical College of Virginia
Richmond, Virginia

RADKE, Hubert M.D.
(General Surgery--Vascular)
Chief of Surgery
Veterans Administration Hospital
Seattle, Washington

WINTERBAUER, Richard, M.D.
Chief, Section of Chest and
Infectious Disease)
Clinical Asociate Professor
of Medicine
University of Washington
School of Medicine
Seattle, Washington

Staff

Batelle Memorial Institute
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Seattle, Washington

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

UROLOGY DELPHI PANEL

Conveners

SPIVEY, Bruce E., M.D.
President
Pacific Medical Center
San Francisco, California

MORGAN, Beverly C., M.D.
Professor and Chairman
Department of Pediatrics
University of Washington
School of Medicine
Seattle, Washington

Panelists

ALLEN, Terry D., M.D.
(Urology)
Professor of Urology
University of Texas
Southwestern Medical School
Dallas, Texas

BARTON, David M., M.D.
(Obstetrics-Gynecology, Urology)
Director, Community Clinical Unit
in Obstetrics-Gynecology
Univeristy of Washingotn (WAMI)
Boise, Idaho

DUCKETT, John W., Jr., M.D.
(Pediatric Urology)
Assistant Surgeon in Urology
Children's Hospital
Senior Surgeon
Hospital of the University
of Pennsylvania
Philadelphia, Pennsylvania

EVANS, Arthur T., M.D.
(Urology)
Professor of Surgery/Urologic
Division
Director, Division of Urology
University of Cincinnati
Medical Center
Cincinnati, Ohio

GLENN, James, M.D.
(Urology)
Professor of Urology
Duke Univerisity School of
Medicine
Durham, North Carolina

JONES, Lawrence, M.D.
(Urology)
Clinical Instructor
Department of Surgery
University of California
Los Angeles, California

NIXON, Richard, M.D.
(Family Medicine)
Assistant Clinical Professor
of Family Practice
University of California
at Irvine
California College of Medicine
Long Beach, California

ROTH, Steven, D.O.
(Urology)
Associate Clinical Professor
Michigan State University
College of Medicine
Private Practice
Livonia, Michigan

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UROLOGY DELPHI PANEL (Cont'd)

SMITH, Col. Lawrence R., M.D.
Col., MC, USAF
(Pediatrics)
USAF/SG Regional Hospital
March AFB, California

WILSON, Rodman, M.D., F.A.C.P.
(Internist)
Private Practice
Anchorage, Alaska

ZOLLINGER, Robert, Jr., M.D.
(General Surgery)
Private Practice)
Cleveland, Ohio

Staff

Battelle Memorial Institute
Human Affairs Research Centers
Seattle, Washington

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